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Initialled abstracts in the present number are by D. W. Goodall and H. Wormald of the East Malling Research Station and by Mrs. R. M. Ingham of the Imperial Bureau of Plant Breeding and Genetics, Cambridge.

N.B.—Until further notice all specific names of plants, diseases and pests, however derived, will be printed with a small initial letter in Horticultural Abstracts.

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Horticultural Abstracts

Vol. XI

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MISCELLANEOUS.

*Growth substances.**

331. TINCKER, M. A. H. 577.15.04

Application of plant growth substances in practice.*Nature*, 1941, 147 : 439-42, bibl. 39.

The origin, phases of investigation and practical results of the study of plant growth substances are traced. In outlining the growth and expansion of the investigations from 1910 to the present time the principal results obtained by each of the more prominent workers throughout the world are summarized in a few lines. As a result the paper will prove very convenient for quick reference.

332. SKOOG, F. 577.15.04 : 546.47

Relationships between zinc and auxin in the growth of higher plants.*Amer. J. Bot.*, 1940, 27 : 939-51, bibl. 31.

Relationships between auxin and zinc were studied in tomato and sunflower plants grown in highly purified solutions in the greenhouse. Comparative experiments with copper- and manganese-deficient tomato plants were included. It is concluded that Zn is not principally required for the synthesis of auxin but for its maintenance in an active state. Lack of Zn leads to excessive destruction (probably oxidization) of auxin. This in turn causes retardation of growth and abnormalities in correlative functions. On this basis the present results as well as the numerous observations in the literature on the effects of Zn on growth can be co-ordinated and at least partially understood. [From author's summary.]

333. THIMANN, K. V., AND SKOOG, F. 577.15.04

The extraction of auxin from plant tissues.*Amer. J. Bot.*, 1940, 27 : 951-60, bibl. 23.

The extraction of auxin by solvents from a number of plant materials has been studied. The solvents used were ether chloroform, ethyl alcohol and water. The plant material used was *Lemna*, *Avena* coleoptiles and roots and leaves, *Phaseolus* root nodules and cultured *Nicotiana* callus. Each differed from the other in behaviour.

334. GRACE, N. H. 577.15.04

Physiological activity of a series of naphthyl acids.

Reprinted from *Canad. J. Res.*, 1939, 17, Sec. C, pp. 247-55, bibl. 5, as *N.R.C.* No. 825.

An homologous series of ω -naphthyl, aliphatic acids from the acetic to the hexoic has been presented to the author by Dr. R. H. Manske, and the physiological activity of these has been determined by the rooting response of plant cuttings treated with solutions of each. Statistically significant positive effects have been noted on the number of cuttings that rooted, the number and length of roots per rooted cutting, and the mean root length. The results with several plant species indicate that activity exists up to and including naphthyl hexoic acid, the highest member of the series tested. A noteworthy feature of the results is the activity of the acids with an even number of carbon atoms in the side chain; those with an odd number have activity of a lower order. [Author's summary.]

* See also 413, 469, 475, 506, 589.

335. GRACE, N. H., FARRAR, J. L., AND HOPKINS, J. W. 577.15.04
Vegetative propagation of conifers.* VII. Outdoor propagation of a November collection of Norway spruce cuttings treated with phytohormones, cane sugar and an organic mercurial disinfectant.
Canad. J. Res., 1940, 18, Sec. C, pp. 566-77, bibl. 19.

Outside propagation of Norway spruce cuttings taken in November resulted in much better rooting than in the greenhouse. The propagation medium of peat and sand undoubtedly greatly contributed towards improved rooting and new growth development. Before planting the cuttings were treated with talc dusts containing indolylacetic acid and naphthylacetic acids in three concentrations, 0, 1,000 and 5,000 p.p.m. alone and in combination with cane sugar and an organic mercurial disinfectant. Phytohormone treatment, except with 5,000 p.p.m. naphthylacetic acid which was injurious, increased the number of cuttings rooted, the number and length of roots, the number of surviving cuttings and the number of rooted cuttings with new growth. Organic mercury increased the number of cuttings rooted by 6%. Cane sugar also produced a small significant favourable response.

336. GRACE, N. H., AND FARRAR, J. L. 577.15.04
Vegetative propagation of conifers. VIII. Effects of media and phyto-hormone dust treatments on the rooting of Norway spruce cuttings.
Canad. J. Res., 1941, 18, Sec. C, pp. 591-8, bibl. 12.

Dormant Norway spruce cuttings collected in November were treated with talc dusts containing indolylacetic acid, planted in five media including two different sands and mixtures of these with peat humus, and propagated in a greenhouse. While 1,000 p.p.m. indolylacetic acid treatment increased survival in sand and there were interactions between media and phyto-hormone treatments, the marked differences between the various media were the striking feature of the results. Mixtures of peat humus with sand were uniformly superior to sand only. There were also some differences between a fine and a coarse sand, when used either alone or in combination with peat. It may accordingly be concluded that selection of a suitable medium is of great importance in the propagation of Norway spruce cuttings. [Authors' summary.]

337. GRACE, N. H., AND FARRAR, J. L. 577.15.04
Effects of talc dusts containing phytohormone, nutrient salts, and an organic mercurial disinfectant on the rooting of dormant *Taxus* cuttings.
Canad. J. Res., 1941, 19, Sec. C, pp. 21-6, bibl. 18.

Dormant *Taxus cuspidata* cuttings were treated with talc dusts containing 1- and 2- γ -naphthyl-butyric acid at concentrations of 0, 500, 1,000 and 2,000 p.p.m. each taken separately and in combination with 0, 0.1, 1 and 10% of a mixture of nutrient salts and 0 and 50 p.p.m. of ethyl mercuric bromide. No significant effects were obtained on number rooting. The phytohormone increased root length and root numbers with ascending concentration. The nutrient salts at 1 and 10% concentrations increased average root length only in the presence of the phyto-hormone. Some other barely significant results are also noted.

338. FARRAR, J. L., AND GRACE, N. H. 577.15.04
Note on the propagation by cuttings of white pine and white spruce.
Canad. J. Res., 1940, 18, Sec. C, p. 612, bibl. 2.

The authors succeeded in rooting high percentages of cuttings of white pine (*Pinus strobus*) and white spruce (*Picea glauca*) not normally considered easy subjects. The cuttings were of current year's growth taken from 10-15-year-old trees in autumn and planted in a mixture of peat and sand or peat or sand alone in outside frames protected by lath and factory cotton shades, the propagation media resting directly on the ground. A well decomposed native peat of sedge origin gave better rooting than the European peat moss of sphagnum origin commonly used in horticulture. It also had a very pronounced effect in stimulating shoot production. The chief factors influencing rooting were the nature of the propagation medium and the time of taking the cuttings. Late July was most favourable for white spruce

* Parts I-VI, *Ibidem* 17, Sec. C, pp. 178-80, 312-6, 376-9; *H.A.*, 10: 10, 11, 12; and 18, Sec. C, pp. 13-7, 122-8, 401-14; *H.A.*, 10: 802, 803 and 11: 2.

and mid-August for white pine. Indolylacetic acid mixed with talc dust and applied to the base of the cuttings had no marked effect on rooting.

339. BAUSOR, S. C., REINHART, W. L., AND TICE, G. A. 577.15.04 : 635.64
Histological changes in tomato stems incident to treatment with β -naphthoxyacetic acid.
Amer. J. Bot., 1940, 27 : 769-79, bibl. 31.

The histological responses of very young, immature, and older tomato stems to 0.1 and 1.0% β -naphthoxyacetic acid are described. The organization of root primordia comes about through the activity of the pericycle and the phloem parenchyma. The root cap develops from the endodermis. Multiple-roots develop from different centers of organization and also from the secondary establishment of new centers of growth in the primordium. The inhibiting and stimulating properties of different concentrations of β -naphthoxyacetic acid are analysed. 0.1% is stimulating to all tissues except the apical meristem, while 1.0% inhibits growth. 1.0% is toxic to the apical meristem, 0.1% inhibits its growth. The transport of the growth substance was greatest basipetally, least radially, and approximately equal tangentially and acropetally. The gradient of response laterally, and above or below areas treated with a concentration of 1.0% was interpreted as being due to the dilution of the substance in the course of its movement. [Authors' summary.]

340. WHITE, P. R. 635.64 : 581.144.2
Vitamin B₆, nicotinic acid, pyridine, glycine and thiamin in the nutrition of excised tomato roots.
Amer. J. Bot., 1940, 27 : 811-21, bibl. 19.

Experiments have shown that under standard conditions vitamin B₆ does not improve the growth of two strains of excised tomato roots in any nutrient containing adequate amounts of thiamin (vitamin B₁). Nicotinic acid and pyridine do not significantly stimulate growth of our strain of tomato roots under similar conditions. It is concluded that vitamin B₆, nicotinic acid, and pyridine are without value as growth-promoting substances for tomato roots of these strains, grown under standard conditions. This conclusion differs from those of Robbins and Schmidt and of Bonner and Devirian. Some possible reasons for the differences in results are discussed. [Author's summary.]

341. TEMPLEMAN, W. G., AND POLLARD, N. 577.15.04 : 635.64
The effect of vitamin B₁ and nicotinic acid upon growth and yield of spring oats and tomatoes in sand culture.
Ann. Bot., Lond., 1941, 5 : 133-47, bibl. 24.

Tomatoes and spring oats did not respond to applications of vitamin B₁ and nicotinic acid at each of two concentrations and in four combinations of the two levels; so that if these two materials are necessary for the growth of the plants in question the plants can themselves produce sufficient to render external application superfluous. The results provide evidence that excellent crops can be grown by means of sand culture technique in the complete absence of organic material, provided due attention is paid to nutrient and water requirements. In the latest experiments the tomato crop averaged 11.2 lb. per plant and no blossom-end rot occurred. In this case the nutrient solution was 100 N + 50 P₂O₅ + 200 K₂O mgm./litre. The average yield for soil culture under commercial conditions is from 6 to 10 lb. per plant. Attention is called to the importance of West's* experiments which suggest that the growth of slow growing plants may possibly be accelerated by being grown in association with those of rapid growth such as those forming the subject of the present paper.

342. PORTHEIM, L. 577.15.04
Further studies on the action of heteroauxin on *Phaseolus vulgaris*.
Ann. Bot., Lond., 1941, 5 : 35-46, bibl. 10.

It is shown that 0.1% β -indolylacetic acid in agar is capable of inducing and stimulating curvatures, elongations and various types of swelling in the petioles of bean from which the lamina has been removed. The changes occur in the petiole as well as in the joints at the base of the

* *Nature*, 1939, 144 : 1050-1.

petiole and just below the point of attachment of the petiole to the lamina. The abscission of the petiole is also prevented and the life of the petiole deprived of its leaves may be said to be prolonged. Possibly the heteroauxin operates by controlling directly or indirectly the distribution and movement of water within the plant. In the latter case it may operate by changing the conditions in the petioles or stalks.

343. MITCHELL, J. W., AND WHITEHEAD, M. R. 577.15.04 : 635.65
Starch hydrolysis in bean leaves as affected by application of growth regulating substances.

Bot. Gaz., 1940, 102 : 393-9, bibl. 9.

1. Lanolin emulsions containing various growth-regulating chemicals were sprayed on attached bean leaves and the plants were subsequently placed in darkness, together with controls. Quantitative analysis of the starch and dextrin content of the leaves showed that application of sprays containing indoleacetic, naphthaleneacetic, indolebutyric, indolepropionic, and naphthoxyacetic acids resulted in marked increase in the rate of starch digestion. Phenylacetic acid resulted in only a slight increase, while naphthalene acetamide had no noticeable effect. 2. Treatment of relatively old and mature leaves with these various chemicals either failed to stimulate or inhibited to some extent the hydrolysis of starch during a 12-hour period of darkness following treatment. 3. Application of these growth-regulating chemicals did not result in a noticeable increase in the rate of starch digestion in leaves kept at 62°-64° or at 90°-92°, but was effective at 74°-76° F. 4. The sugar content of leaves kept in darkness increased appreciably for a period of time following treatment with indoleacetic acid, a response previously observed in leaves treated with naphthaleneacetic acid. [Authors' summary.]

344. BENNETT, J. P., OSERKOWSKY, J., AND JACOBSON, L. 577.15.04 : 581.144
Glutathione and the rest period of buds.

Amer. J. Bot., 1940, 27 : 883-7, bibl. 8.

Glutathione is shown to play little part in the rest breaking action of yeast extracts on buds of apple, pear and peach. That some effect was obtained with large doses of prepared glutathione is probably due to some active substance(s) carried along with the glutathione in its preparation from yeast or other biological material.

345. BURKHOLDER, P. R., AND McVEIGH, I. 577.16 : 581.192
Studies on thiamin in green plants with the *Phycomyces* assay method.

Amer. J. Bot., 1940, 27 : 853-61, bibl. 25.

A report is made of *Phycomyces* assays for thiamin (vitamin B₁) activity in certain inbred lines and hybrids of maize grown on varied supplies of nitrogen and phosphorus in sand culture. Brief attention is given to the techniques and validity of the methods together with a discussion of growth factors for *Phycomyces* contributed by plant tissue added to certain kinds of synthetic media.

346. MILBRATH, J. A., AND HARTMAN, H. 577.15.04
Holly defoliation prevented by α -naphthaleneacetic acid.

Science, 1940, 92 : 401.

Holly sprayed with .005% α -naphthaleneacetic acid solution retained its leaves for 8 days, and that sprayed with .01% solution for 14 days, whereas untreated holly shed its leaves in 48 hours.

347. VAN OVERBEEK, J. 577.15.04
A quantitative study of auxin and its precursor in coleoptiles.

Amer. J. Bot., 1941, 28 : 1-9, bibl. 16.

GRACE, N. H. 577.15.04

Effects of tale and phytohormone treatment on the rooting of dahlia cuttings.

Canad. J. Res., 1941, 19, Sec. C, pp. 40-1, bibl. 6.

MYERS, R. M. 577.15.04

Effect of growth substances on the absciss layer in leaves of coleus.

Bot. Gaz., 1940, 102 : 323-8, bibl. 25.

- BEAL, J. M. 577.15.04 : 635.65
Effect of indoleacetic acid on thin sections and detached segments of the second internode of the bean.
Bot. Gaz., 1940, 102 : 366-72, bibl. 2.
- MULLISON, W. R. 577.15.04 : 635.65
Histological responses of bean plants to tetrahydrofurfuryl butyrate.
Bot. Gaz., 1940, 102 : 373-81, bibl. 3.
- GUSTAFSON, F. G. 577.15.04
Lack of inhibition of lateral buds by the growth promoting substance phenyl-acetic acid.
Plant Physiol., 1941, 16 : 203-6, bibl. 12.
- KAISER, S., AND ALBAUM, H. G. 577.15.04
A simple adaptation of the Went coleoptile assay method for auxin.
Amer. J. Bot., 1940, 27 : 726-7, bibl. 3.
- SCHNEIDER, C. L. 577.15.04
The dependence of the *Avena* coleoptile growth-rate on the previous auxin supply.
Amer. J. Bot., 1940, 27 : 711-8, bibl. 10.
- GRACE, N. H. 577.15.04
Responses of dormant cuttings of *Lonicera tartarica* to solutions of cane sugar and indolylacetic acid.
 Reprinted from *Canad. J. Res.*, 1939, 17, Sec. C, pp. 334-8, bibl. 4 as N.R.C. No. 843.

Apparatus.*

348. GLOVER, J. 581.11
A method for the continuous measurement of transpiration of single leaves under natural conditions.
Ann. Bot., Lond., 1941, 5 : 25-34, bibl. 2.

An apparatus for the continuous measurement of the water vapour transpired by a portion of a leaf under approximately normal environmental conditions is described. The conditions fulfilled by the method are as follows:—The part of the plant under study remains attached to the intact rooted plant, the environmental conditions are not altered, the transpiration rate is calculable in absolute units, i.e. weight of water/unit area/unit time, and the transpiration rate is measurable over short intervals of time, preferably continuously. Illustrations of its use in the study of the march of transpiration on *Coffea arabica* and *Zea mays* are given.

349. GILBERT, S. G., AND SHIVE, J. W. 581.12
A direct-reading flowmeter and its use in respiration studies with plants.
Soil Sci., 1941, 51 : 55-8.

The device described and figured enables rapid and accurate measurements of slow rates of flow of small volumes of gas in root respiration studies. The apparatus is essentially a manometer to measure the pressure difference on the two sides of an orifice caused by resistance of the constriction to the passage of gas.

350. FERGUSON, F. F., AND WEBB, L. W. 535.33
Comparative transmission spectrograms of an irradiated leaf extract.
Plant Physiol., 1941, 16 : 210-1, bibl. 2.

A preliminary effort to show something of the spectrographic changes which occur upon radiation of an alcoholic solution of leaf green.

351. BALL, E. 578.6
Microtechnique for the shoot apex.
Amer. J. Bot., 1941, 28 : 233-43, bibl. 32.

An account is given of the processes involved in the latest methods of mounting and examining the shoot apex in *Tradescantia fluminensis* and other plants.

* See also 455.

352. SPURWAY, C. H. 621.31 : 632.19
Electro-foliar diagnosis.
Science, 1940, **92** : 489-90.

It was considered that qualitative or semi-quantitative spot tests for iron and manganese in case of chlorosis might be obtained by electrolysing leaf tissue and catching the removable ions in chemically treated filter paper. Descriptions of the apparatus devised and the methods used are given here.

353. LEGGATT, C. W. 578.08 : 631.531
A new seed mixer and sampler.
Sci. Agric., 1941, **21** : 233-6.

Details of design and construction with four drawings are given of a laboratory seed mixer and sampler based on what is believed to be a new principle which may also be adapted to large-scale bulking of seeds.

354. ANON. 631.3
Cleaning rusty garden tools.
Gdnrs' Chron., Lond., 1941, **109** : 82.

In bad cases of rust on garden tools, if soaking in paraffin proves ineffective, the following formula may be tried. Mix 1 part of glycerine with 2 parts oxalic acid and 5 parts ground silica, coat the tool with the paste and stand in a warm place for 20 minutes. Then wash with warm water and both paste and rust will come away together.

355. AYLEN, D. 631.67
A new ditcher.
Rhod. agric. J., 1941, **38** : 8-14.

A simple and most effective modification to the grader blade of ditchers has been tested in Southern Rhodesia. The article gives a brief account of the machine and the results obtained. There are four illustrations.

356. DIRECCION GENERAL DE AGRICULTURA, GUATEMALA. 634.993
Utilísima máquina para arrancar troncos. (A useful appliance for extracting tree stumps.)
Rev. agric., Guatemala, 1940, **17** : 229-34.

A simple and ingenious hand-made apparatus for quickly extracting tree stumps by the roots from the ground without the aid of a tractor is described and illustrated by 14 photographs.

Physiology.

357. ADLER, R. 612.014.44
Das Wesen der Kurz- und Langtagpflanzen. (The nature of short and long day plants.)*
Forschungsdienst, 1940, **9** : 332-67, bibl. 26.

(1) Light, temperature and other environmental factors have stimulating effects on plant physiology and determine the course of individual growth stages, particularly that which leads to flowering. (2) Plants needing long days with a period of more than 14 hours light are long day plants, while those which flower earliest when days are short are short day plants. Intermediate or neutral plants react similarly to long and short days. In tuberous plants, such as the potato, light reaction on tuber formation serves as a basis for classification. (3) Plants of the temperate and cold zones with long days in their growing period are long day plants. Short day plants come from the tropical and sub-tropical zones. (4) Plants do not need periodical changes of light and dark, but the required amounts of light and darkness can actually all be given at one time in each case. Plant genera often show variation in their reactions to light periodicity.

* A full translation is available at the I.B. Pasture and Forage Crops, Agricultural Research Building, Aberystwyth.

A definite photoperiodic character may be more or less marked or vary from one extreme to the other. Maize growing in North America affords one good example of the necessity for careful selection in this respect. (5) In sunlight the red, long wave rays are especially responsible for the long day effect. Blue, short wave light has the same effect as darkness. Hence for artificial lighting neon light, sodium gaslight and filtered light, with strong red rays predominating, are chosen. The long day effect is easily obtainable with a minimum light strength. Thus $\frac{1}{4}$ Lux moonlight has definite stimulating effect. Weak, cheap lighting strength can be used when applying additional artificial light. (6) Plants are particularly susceptible to light and temperature immediately after germination. The impressions received at this stage work themselves out in their further development. The embryo or seedling can have a definite course of development determined for it and we speak of embryo determination or seedling determination (Keim-bestimmung). This determination is to be understood as meaning that we can by improvement of light conditions so prepare the way for further quick passage through its various growth stages that later unfavourable daylight conditions will be unable to slow down its life's progress. To change a long day plant into a short day plant seems to be quite impossible. (7) Environmental factors work jointly as a complex. They may mask one another's effects. The whole factor complex can be upset by artificial determination. (8) According to Kopetz the whole development period consists of the vegetative development period V plus the reproductive development period R. The vegetative development period consists of a definite minimum time, which cannot be shortened, made up of the pure vegetative development V_1 and a waiting period, special vegetative development V_2 . Flowering inhibitions due to photoperiodic phenomena disappear given a particular length of day known as the critical day length k . (9) Shortening the development period to its minimum by application of suitable light treatment is generally associated with weak total bulk development. (10) Photoperiodic reaction is an inherited character. It can be changed by alteration of the genotype. Variations exist as the result of mutation; by selection and hybridization strange types can be made suitable to new surroundings. (11) The physiological reasons of photoperiodic reaction are not yet clear. A definite ratio of C assimilates to N compounds is necessary to induce the flowering stage. Kopetz considers that development materials can be activated by the accumulation of a definite radiation energy at the moment when the threshold of stimulation is reached. If the vital processes are considered as reduction and oxidation, then the enzymes which regulate them, being themselves subject to alteration in different ways by outside influence, can be activated. (12) The outer form of the plant, the course of the physiological processes and the constitution of the plant often suffer considerable changes as the result of changing the length of day or of changes in combination of the environmental factor complex. This betokens (13) the importance for success of the conditions under which plant production and plant breeding are carried on. It has its application in I, the technique of plant breeding; II, variety trials; III, the establishment of new aims in breeding; IV, embryo- and seedling pre-determination as an aid to practical plant production. (14) Success has already been achieved by the use of short and long day treatment of garden plants. Among successes achieved by lengthening or shortening the period of daylight in flowering plants the following may be noted:—Accelerating flowering in chrysanthemum by giving short day (i.e. less light) treatment and delaying flowering till February or March by long day treatment. Accelerating flowering in *Kalanchoe globulifera* by 2 months by short day treatment. Forcing violets to bloom in summer by covering daily from 5 till 7 p.m. Cloth house work in U.S.A. with a number of plants, e.g. chrysanthemum, zinnia, tagetes, cheiranthus, calendula, aster. Accelerating flowering and ensuring good seed production in carnations by long day treatment. Accelerating flowering in *Calceolaria multiflora nana* by long day treatment. [Author's summary.]

358. AUSTIN, J. P. 612.014.44
The influence of the length of the photoperiod on the vegetative and reproductive development of *Rudbeckia bicolor superba*, *Delphinium ajacis*, *Cosmos sulphureus* and *Impatiens balsamina*.
Amer. J. Bot., 1941, 28 : 244-50, bibl. 10.

Four types of flower plant were subjected to photoperiods of 8 to 20 hours under otherwise comparable conditions. The widely different growth responses are analysed and discussed.

359. WENT, F. W. 612.014.44 : 581.144

Effects of light on stem and leaf growth.

Amer. J. Bot., 1941, **28** : 83-95, bibl. 28.

Pea seedlings were the experimental material. Different intensities of red and orange dark room light (wavelengths from 5,500 Å on with Corning 348 filter) for variable periods were given daily and the effects on growth noted.

360. DEXTER, S. T. 581.143.26.03

Effects of periods of warm weather upon the winter hardened condition of a plant.

Plant Physiol., 1941, **16** : 181-8, bibl. 15.

As the result of submitting wheat and lucerne to vernalization the author sums up as follows :—As a general proposition it can be stated that hardening of plants is favoured by conditions which tend towards the accumulation or conservation of carbohydrates and other reserve foods, namely those which further photosynthesis and lessen respiration and extension of vegetative parts.

361. WEGER, N. 581.084.1

Die Temperaturverhältnisse in Isolierkästen. (Temperature conditions in isolation boxes.)

Gartenbauwirtsch., 1940, **14** : 604-13, from abstract *Forschungsdienst*, 1940, Vol. **10**, abstr. p. 118.

Plants in small isolation boxes were found to suffer from frost more than neighbouring plants in the open. Examination showed that the maximum and minimum temperature curves inside the boxes differed from those outside. The early morning rise in temperature was steeper in than out of the boxes and the deviation greater. Increasing the size of the boxes results in less variation. The boxes should be shallow in comparison with their other dimensions and any covering used should be of as wide-meshed and smooth-fibred material as possible.

362. ESAU, K., AND HEWITT, W. B. 581.17

Structure of end walls in differentiating vessels.

Hilgardia, 1940, **13** : 229-37, bibl. 30.

The differentiating vessel elements of the herbaceous angiosperms here considered, *Cucurbita pepo*, *Zea mays*, *Nicotiana tabacum*, *Daucus carota* and *Beta vulgaris* show intact end walls until the future vessel reaches its final diameter and develops secondary lignified layers on the longitudinal walls. Two superposed vessel elements are separated from each other by two cellulose layers—the two primary walls—cemented together by isotropic intercellular substance. [Authors' summary.]

363. KRAMER, P. J. 581.13

Sap pressure and exudation.

Amer. J. Bot., 1940, **27** : 929-31, bibl. 12.

Working with *Acer rubrum* L., *Betula nigra* L. and *Carpinus caroliniana* Walt. the authors are able to show that, contrary to the contention of James and Baker,* sap exudation does occur from the xylem vessels. Apparently this is also true of herbaceous species. The results were obtained by attaching cups of acid fuchsin solution to the tree and drilling holes into the trunk beneath the surface of the dye; or by placing the dye in reservoirs attached to freshly cut stumps. No penetration of dye ever occurred during exudation of sap, but when sap flow ceased, usually in the afternoon, dye immediately penetrated the stems.

364. SCARTH, G. W. 632.1

Dehydration injury and resistance.

Plant Physiol., 1941, **16** : 171-9, bibl. 9.

Different kinds and conditions of plant material show parallel variation in their resistance to drought, frost, and plasmolysis, respectively. The maximum plasmolysis that cells can withstand is determined by the point at which an irreversible stiffening, presumably coagulation, of the ectoplasm occurs. The immediate cause of death is usually the rupture of the rigid ectoplasm on deplasmolysis. It is suggested that a similar colloidal change follows upon a certain critical

* *New Phytol.*, 1933, **32** : 317-43.

degree of dehydration when produced by frost or evaporation and that with these also mechanical stresses may later cause the fatal rupture. In hardy cells the ectoplasm has a lower refractive index and higher permeability than in unhardy. These differences point to greater hydration of the ectoplasm, the most probable cause of which is greater water binding power of its colloids. The same colloidal difference might account for the greater resistance to coagulation through dehydration. [Author's summary.]

365. LEVITT, J., AND SIMINOVITCH, D. 632.111 : 576.3

The relation between frost resistance and the physical state of protoplasm.

I. The protoplasm as a whole.

Canad. J. Res., 1940, **18**, Sec. C, pp. 550-61, bibl. 7.

The protoplasm of hardy and non-hardy cells was compared with regard to displacement by centrifuging, rounding-up time on plasmolysis, deplasmolysis injury, rate of Brownian movement, resistance to and recovery from distortion by micromanipulation. The conclusions are :— (i) when the cells are in the normally hydrated (i.e. turgid) condition there is either no difference in the consistency of hardy and non-hardy protoplasm, or else it is slightly less in the latter ; (ii) when the cells are plasmolyzed to the same degree (i.e. with a weaker plasmolyte in the case of the non-hardy) there is no difference in consistency ; (iii) when the cells are in equilibrium with one and the same concentration of plasmolyte, the protoplasmal consistency of the non-hardy is greater than that of the hardy ; (iv) the non-hardy are more susceptible to mechanical injury. [Authors' summary.]

366. SIMINOVITCH, D., AND LEVITT, J. 632.111 : 576.3

The relation between frost resistance and the physical state of protoplasm.

II. The protoplasmic surface.

Canad. J. Res., 1941, **19**, Sec. C, pp. 9-20, bibl. 9.

Deplasmolysis injury, ductility of cytoplasmic strands, and the shape assumed by injected oil drops on deplasmolysis were investigated. The surface membrane of the protoplast of non-hardy cells stiffened when dehydrated osmotically. As a result, it ruptured readily when subjected to tension. The stiffening either failed to occur in hardy cells, or it arose only as a result of a much greater dehydration (depending on the degree of hardness). The refractive index of the protoplasmic surface increased more on dehydration in the case of non-hardy than of hardy cells. Plasmolysis, if maintained for some time, induced a clumping of plastids and granules (systrophy) in non-hardy but not in hardy cells. All these facts indicate a greater hydrophily in hardy than in non-hardy cells—both of the surface membrane of the protoplasm and, as shown in Part I, of the protoplasm as a whole, although it is probably less marked in the latter. [Authors' summary.]

367. LUDWIG, C. A., AND ALLISON, F. E. 631.847

Further experiments concerning the diffusion of nitrogenous compounds from healthy legume nodules or roots.

Amer. J. Bot., 1940, **27** : 719-25, bibl. 33.

Experiments are described which indicate that excretion of nitrogenous materials from legume nodules is not likely to prove important in soils of ordinary productivity.

Nutrition.

368. H., R. C.* 631.8

Manurial experiments for planters.

New Guinea agric. Gaz., 1941, **7** : 66-71.

A system is described which will enable a planter to carry out simple manurial experiments with three replications and to assess the results with reasonable accuracy without recourse to statistical analysis.

369. PIPER, C. S. 547.25.77 : 631.811.9

Molybdenum as an essential element for plant growth.

J. Aust. Inst. agric. Sci., 1940, **6** : 162-4, bibl. 2.

Experiments are described in which in the absence of molybdenum wheat grown in nutrient solutions developed necrotic areas on the upper leaves and empty instead of grain-filled husks.

* From a pamphlet by Jacob and Coyle.

Since only 0.02 mg. per litre of nutrient solution is more than sufficient for normal growth, a very high degree of purification in the reagents used is required. Investigations with more highly purified reagents are in progress.

370. LOEWING, W. F. 581.145.1 : 631.8
Mineral nutrients in relation to flower development.
Science, 1941, **92** : 517-20.

The author reviews his recent work on the rôle of mineral nutrients in relation to reproduction and sex expression in higher plants. Summarizing, he states that the sequence of physiological events antecedent to and concurrent with flowering comprises, first the change in internal water balance, followed in turn by altered translocation and redistribution of nutrients. Precise knowledge of the pattern of salt distribution aids in identification of phosphorus and nitrogen as the inorganic ions most closely associated with early phases of the transition from the vegetative to the reproductive phase. Amino compounds seem to be especially specific in their effects on sex processes and studies are under way to identify them and determine the precise rôle of commonly occurring amino acids.

371. WORLOCK, R. F. 631.874
 Abonos verdes. (Green manuring.)
Rev. B.A.P., 1940, **23** : 269 : 21, 23-5, 27.

The question of green manuring under the conditions of the province of Cuyo, Argentine, is discussed.

372. JACOB, K. D., AND ROSS, W. H. 631.85
Nutrient value of the phosphorus in difluorinated phosphate, calcium metaphosphate and other phosphatic materials as determined by growth of plants in pot experiments.
J. agric. Res., 1940, **61** : 539-60, bibl. 76.

Different types of soil were used with Sudan grass, German millet and tomatoes.

General.

373. BOYCE THOMPSON INSTITUTE. 634/5
Souvenir booklet of the Boyce Thompson Institute for plant research.
 Yonkers, New York, 1940, pp. 8.

A brief account is given of the institute and some of the work in progress there, especially that on the dormancy and storage of seed and pollen, the forcing of recently harvested potato tubers into growth, and responses to growth substances.

374. CHEMISTRY AND INDUSTRY. 63
British Empire Number.
Chemistry and Industry, 1941, Vol. **60**, No. 17, pp. 273-331.

This number contains a set of articles dealing with the products of most of the separate lands which form the British Commonwealth of Nations. Among these products are those of agriculture.

375. ASLIB. 659.25.63
Aslib war-time guides to British sources of specialised information. No. 2. Agriculture and allied interests.
Publ. Ass. special Libraries and Information Bureaux, 31 Museum Street, London, W.C.1, 6s., mimeographed.

A useful publication briefly describing the functions and giving the addresses of the various Institutions and other authorities from which information on agriculture, horticulture and allied interests can be obtained. Publications issued by these bodies are noted.

376. MCCALLAN, S. E. A., AND SETTERSTRÖM, C. 632.184
Toxicity of ammonia, chlorine, hydrogen cyanide, hydrogen sulphide and sulphur dioxide gases. I. General methods and correlations.
Contr. Boyce Thompson Inst., 1940, **11** : 325-30, bibl. 10.

McCALLAN, S. E. A., AND WEEDON, F. R.

Toxicity of ammonia, chlorine, hydrogen cyanide, hydrogen sulphide and sulphur dioxide gases. II. Fungi and bacteria.

Contr. Boyce Thompson Inst., 1940, 11 : 331-42, bibl. 15.

THORNTON, N. C., AND SETTERSTROM, C.

Toxicity of ammonia, chlorine, hydrogen cyanide, hydrogen sulphide and sulphur dioxide gases. III. Green plants.

Contr. Boyce Thompson Inst., 1940, 11 : 343-56, bibl. 8.

BARTON, L. V.

Toxicity of ammonia, chlorine, hydrogen cyanide, hydrogen sulphide and sulphur dioxide gases. IV. Seeds.

Contr. Boyce Thompson Inst., 1940, 11 : 357-63, bibl. 4.

All the above papers have summaries. There is a further contribution on the effect of the gases aimed on animals.

377. STEYN, D. G.

612.014.46 : 633/635

The poisoning of human beings by wild plants, ornamental plants and domestic poisons.

Fmg S. Afr., 1941, 16 : 11-8.

A number of common plants either wild or introduced to garden cultivation are very poisonous, a fact often entirely unsuspected. Brief illustrated notes are given of a number of these for South Africa. The dangers, especially to children, of various spray materials, rat poisons, etc., which are usually treated carelessly, is pointed out. Cucumber, marrows, melons eaten when hot as a result of exposure to the sun, either after or before picking, have often caused poisoning and other fruits in this condition are also often dangerous.

378. KELLEY, A. P.

581.144.2 : 634.975.75

The variations in form of mycorrhizal short-roots of *Pinus virginiana* Mill. associated with certain soil series.

Publ. Landenberg Lab. Pennsylvania, Feb. 10, 1941, pp. 10, bibl. 11 (mimeographed).

The form of a mycorrhiza is determined by the host plant, not by the fungus. The fungus, however, has a secondary effect upon the morphology of the mycorrhiza, in that different sorts of fungi produce differences in amounts of mycelium, thickness of mantle, colours, etc. The soil, by means of the micro-organisms in it which influence its constituents, is the principal modifier of mycorrhizal form. The situation in the mycorrhizal habitat is complex and involves many agents and influences—soil, fungi, micro-organisms, disturbances by other and higher organisms, environmental influences such as slope exposure, amount of insolation, drainage, aeration, kind and amount of litter accumulation, etc. Thus conclusions derived from the laboratory study of single conditions, while important in giving insight into isolated phenomena, are applicable only with premature judgment to the mycorrhizal condition as a whole.

379. FRAPS, G. S., AND FUDGE, J. F.

546.15 : 581.192

Iodine in drinking waters, vegetables, cottonseed meal and roughages.

Bull. Texas agric. Exp. Stat. 595, 1940, pp. 25, bibl. 75.

Iodine in 37 samples of vegetables ranged from 62 to 3,502 parts per billion and was much higher than in corresponding vegetables from areas where goitre is prevalent.

380. MURNEEK, A. E.

612.014.44

Length of day and temperature effects in *Rudbeckia*.

Bot. Gaz., 1941, 102 : 269-79, bibl. 18.

SNYDER, W. E.

612.014.44

Effect of light and temperature on floral initiation in cocklebur and Biloxi soybean.

Bot. Gaz., 1940, 102 : 302-22, bibl. 14.

- ROSENE, H. F. 581.144.2 : 581.11
Comparison of rates of water intake in contiguous regions of intact and isolated roots.
Plant Physiol., 1941, 16 : 19-38, bibl. 18.
- BENNET-CLARK, T. A., AND BEXON, D. 576.341
Water relations of plant cells. II.
New Phytol., 1940, 39 : 337-61, bibl. 16.
- POST, K. 631.548 : 581.084.2
Automatic watering of experimental plots.
Plant Physiol., 1941, 16 : 207-9, bibl. 7.
- LEUKEL, R. W., AND NELSON, O. A. 631.531.17
The use of chlorine gas as a seed disinfectant.
Circ. U.S. Dep. Agric. 576, 1940, pp. 16.
 Trials on bunt- or smut-infected cereal seed.
- SALTER, R. M., AND SCHOLLENBERGER, C. J. 631.86
Farm manure.
Bull. Ohio Exp. Stat. 605, 1939, pp. 69, bibl. 118.
- RICEMAN, D. S., DONALD, C. M., AND EVANS, S. T. 631.454 : 546.56
Further investigation on copper deficiency in plants in South Australia.
Pamphl. Coun. sci. industr. Res. Aust. 96, 1940, pp. 44, bibl. 26.
- STEWART, F. C., AND PRESTON, C. 633.491
The effect of salt concentrations upon the metabolism of potato discs and the contrasted effect of potassium and calcium salts which have a common ion.
Plant Physiol., 1941, 16 : 85-116, bibl. 23.
- CORNISH, E. A. 519
The estimation of missing values in quasifactorial designs.
Ann. Eugen. Camb., 1940, 10 : 137-43, bibl. 8.
- O'NEIL, J. B., AND GUTTERIDGE, H. S. 519
A note on the calculation of standard errors for treatment means after adjustment for regression.
Sci. Agric., 1941, 21 : 358-9, bibl. 6.

TREE FRUITS, DECIDUOUS.

General.

381. KEMMER, E., AND GROSSE, B. 634.11
Aufbau und Struktur des Obstbaugebietes Gransee I and II. (A survey of the Gransee fruitgrowing district of Mecklenburg.)
Forschungsdienst, 1939, 8 : 299-338, and 1940, 10 : 160-82, bibl. 15.
 The first part of this article concerns the farming system of the fruitgrowing district of Gransee. In the second the general ecological conditions are considered. Particulars are given of climate, soil and growth of apple trees and correlations established between this growth and climatic and soil conditions. As in other articles by Kemmer particulars are given in great detail.
382. KEMMER, E. 634.1/7-1.521
Die Bedeutung der Standortfragen für die Obstzüchtung. (The importance of habitat in fruit breeding.)
Forschungsdienst, 1941, 9 : 511-7, bibl. 1.
 The author tries to dispel any lingering idea that the fruit breeder has a clear cut, easy job in breeding for the following points:—(1) increased frost-, drought- and disease-resistance, (2) increased crop and regularity of crop; (3) improvement in fruit quality as regards taste or size and colour. In other words things are not always what they seem. Thus rootstocks may withstand cold perfectly well when ungrafted but not so well when grafted, or the reverse may be found, as in the case of the pear Alexander Lucas on quince A at Berlin Dahlem in the winter of 1938/1939. A rootstock's frost resistance varies with different scions, or it may be found to vary with the same scions under different conditions of cultivation. Thus also at Berlin Dahlem the apple Geheimrat Breuhahn on type IX was badly damaged by frost when the union was above ground level but not at all when it was below ground level. Strawberries (var. Eva Macherauch)

in a manurial trial all suffered severely from frost except those which had received a double peat compost treatment. Again the variety Oberschlesien raised in pots before planting out stood up to frost much better than that planted out from the beginning. Boskoop apples of different origin show the greatest diversity of colour and shape. Yet scion wood from these same localities top-grafted on one particular tree resulted in no such diversity. It is urged that not only must very extensive trial be made under the most diverse conditions of any new production of the breeder before its characters can really be known, but also that data should be made available to the breeder of the idiosyncrasies of different varieties under the widest possible range of conditions. This will give him a much sounder basis on which to work than he has had hitherto.

383. ANSALONI, A. 634.13
Un perastro poco conosciuto da sperimenta. (**An interesting little known wild pear.**)
Riv. Frutticoltura, 1940, 4: 101.

The author describes trees identified as *Pyrus amygdaliformis* Vill. found growing at 500-1,000 metres in the southern Apennines. It is a fairly vigorous species, hardy and very resistant to drought. The fruits ripen in the late autumn and produce a larger quantity of seeds than does *Pyrus communis*. The author sowed a number of seeds in February 1939, all of which germinated, and the resultant plants are to be grafted in August with *P. communis*, *P. communis* var. *volpina* and *P. calleryana*. R.M.I.

384. DUKA, S. KH. 634.11 : 575.12 : 631.541.11
Alteration of the nature of apple seedlings by means of upbringing. [Russian.]
Vernalization, 1940, No. 4 (31), pp. 30-2.

Grafts were made of Apple Hybrid No. 18 on to a number of different rootstocks. The grafts on seedlings of the variety Winter Golden Pearmain were the most influenced, the fruits of the hybrid being very similar to the Pearmain fruits in quality, flavour, time of ripening, etc. This influence was more pronounced than that observed when the hybrid was grafted on to an old tree of Winter Golden Pearmain growing on a wild rootstock.

Rootstocks.

385. SIMPSON, C. 634.1/2-1.541.11
Pies recomendados para porta injertos. (**Recommended fruit tree rootstocks.**)
Sugestiones oportunas Bol. mens. Chacra exp. F.C.S. Cinco Saltos, Argentine, October 1940, p. 3.

In a previous number (July), a list of suitable stocks for fruit trees was quoted from the journal, *Blue Anchor*, of the Californian Fruit Exchange. The author of the present paper writes to correct or amplify for Argentine conditions from his experiences in the orchards of the Pacific Railway in Cuyo Province some of these recommendations. *Peaches*. The best stocks are raised from the seed of the wild peaches in the Cordoba highlands. This stock will stand the local irrigation conditions. *Plums*. Both for European and Japanese plums myrobolan should be exclusively used. It soon produces a large tree. Plums on almond do well at first but after 6 or 7 years they begin to grow erratically, suffer from the heat and fail to leaf or fruit properly. *Almonds*. The best stock is the bitter almond although it often fails in wet or heavy soil. Peach and plum, however, are worse and never make good trees. *Damas plum*. Seedlings of the same variety are best. There is little affinity with myrobolan or peach. *Cherry*. Both mazzard and mahaleb fail sooner or later under Argentine conditions. A guigne cherry is under trial at these nurseries, since there are old established orchards doing well on it. A seedling guigne variety forms a good stock for the same variety. *Walnuts*. *Juglans hindsii* gives satisfaction but *J. regia* is reported from California to stand irrigation better.

386. LANGE, E.-G. 634.11-1.541.11
Der Einfluss der Bodenfeuchtigkeit und Bodentemperatur auf den Verlauf der Bewurzelung bei den Apfelunterlagen E M I-XVIII. (**The effect of soil moisture and temperature on rooting in the stool bed of apple rootstocks E.M. I-XVIII.**)
Gartenbauwiss., 1940, 14: 1-76.

The material for this investigation was taken from the collection of four-year-old stocks at the Horticultural Institute of Berlin Dahlem. The rooted layers were separated from the mother

plants after the leaves had fallen in the autumn and kept well covered with earth until the spring. The tops were then exposed to allow the new shoots to develop freely. When these had reached a length of about 15-20 cm., soil was heaped up round the first 10 cm. This earthing up was repeated 2-3 times until finally about 20-25 cm. of the shoots was covered with soil. The soil was a sandy loam with a pH of 6.9-7. An examination of the shoots was made at frequent intervals and the effect of soil humidity and soil temperature on the rooting of the shoots is summarized as follows:—The first formation of root initials begins in most types at the end of May or the beginning of June, and is equally dependent on the quantity of soil, its temperature and humidity. At this stage both high temperature and high humidity is essential. The development of the root initials, which proceeds up to the middle of July, is increasingly dependent on the external factors of soil temperature and soil humidity. The breaking of the roots through the cortex, which occurs from June till August, and also their further development, depend mainly on the humidity, as at that season the temperature is usually at an optimum. The cessation of root development during the later part of September is due in the first place to the temperature. The behaviour of each of the eighteen types of stocks is then studied in detail. Variations in the beginning of root initial formation are attributed to the genetical make-up of the mother plant but the force of the development is probably due to external conditions. Practical improvements can be made by increasing the water-holding capacity of the soil and by noting the best time to carry out the earthing up process as well as by studying the most suitable form for this to take. R.M.I.

387. MAURER, K. J. 634.11-2.111
 Apfelbuschkulturen im nördlichen Russland. (**Bush apple cultivation in Northern Russia.**)
Deutsch. Obstb., 1940, Heft 4, pp. 64-5, from abstract *Forschungsdienst*, 1940, Vol. 9, abstr. p. 170.

Mitchurin has increased the possibility of apple growing in northern Russia despite its 6-7 month winter. As rootstocks *Malus prunifolia* is used in the coldest and *M. baccata sibirica* in the milder regions. Stocks are budded with material from more favourable apple growing regions and are cut off so as to form a head at a height of 30-40 cm. They are set 6 × 4.5-5 metres apart in rows running north and south. Their short stems are inclined over in a southward direction. A framework holds the lowest branch some 30 cm. above ground level so that the fruits can derive the maximum benefit from soil radiation. The soil is kept open in a circle of 4 m. in diameter. After harvest the top branches are tied together and are well covered with snow after the first snowfall.

388. TRENKLE, R. 634.13-1.541.11
 Versuche mit Birnenveredlung auf Sorbus. (**Trials of grafting pear on Sorbus.**)
Deutsch. Obstb., 1940, No. 3, pp. 51-2, from abstract *Forschungsdienst*, 1940, Vol. 10, abstr. p. 117.

Budding pears on *Sorbus aria* met with no success. Certain varieties, Nouveau Poiteau, Bosc's Flaschenbirne and Gellerts Butterbirne grew well when worked on *Sorbus aucuparia* as also fairly well on *S. scandica*. Other varieties tried, namely Williams, Alexander Lucas, Comtesse de Paris, Josephine de Mechelins, President Drouard gave practically no success, bad unions being almost universal.

Pollination.

389. RAPTOPOULOS, T. 634.23 : 581.162.3
 Pollen-tube growth studies in cherries.
J. Genet., 1941, 42 : 73-89, bibl. 20.

Investigation of the position regarding compatibility between cherry species with different chromosome numbers was undertaken to assist in elucidating the working of the incompatibility mechanism in general. Studies of pollen-tube growth on diploid, triploid and tetraploid styles with the same range of pollen have shown:—1. The tetraploid cherry *Prunus cantabrigiensis* is self-compatible. 2. Self-pollination of triploids fails entirely, in part because of the high sterility

of the pollen and in part from the deformation of the styles and the presence of opposing factors for incompatibility. 3. The style as well as the stigma takes an active part in resisting incompatible pollen tubes. 4. Almost all the cross-pollinations examined are partially compatible, but the proportion of effective pollen tubes ranges considerably. 5. The growth rate of the compatible pollen tubes accelerates on the third and fourth day after pollination, whilst that of the incompatible tubes is greatly decreased and in many cases may be completely arrested in the stylar tissue at this time. 6. Cross-pollinations between diploids and tetraploids are favoured when the tetraploid is used as the female parent. 7. The complexity in behaviour increases with polyploidy and hybridity. [From author's summary.]

390. RAPTOPOULOS, T. 634.23 : 576.312.32 : 581.162.3
Chromosomes and fertility of cherries and their hybrids.
J. Genet., 1941, **42** : 91-113, bibl. 35.

391. BRANSCHIEDT, P., AND PHILIPPI, E. 634.22 : 581.162.3
 Befruchtungsbiologische Untersuchungen an Zwetschen und Pflaumen.
 (Pollination trials with zwetschen and plums.)
Gartenbauwiss., 1940, **14** : 561-90, from abstract *Forschungsdienst*, 1940, Vol. 10,
 abstr. p. 17.

The paper deals with the pollination requirements of zwetschen, in particular the Lützelsachsener Frühzwetsche. A note is given of the importance of wind as a pollinating agent under favourable conditions.

392. WEDMORE, E. B. 638.14 : 621.318.35
Electric heating of beehives. Preliminary report.
Tech. Rep. British Electrical and Allied Industries Res. Ass., Ref. W/T5, 1941,
 pp. 19, bibl. 2, 3s. 6d. (mimeographed).

The report describes preliminary experiments to bring the problem of heating of beehives into proper perspective quantitatively and from the standpoint of beekeeping. The construction and preliminary testing of certain heating units are described. Tests will be made shortly under working conditions on a large scale. There are a number of diagrams and some interesting observations on the formation of the winter cluster within the hive and its method of maintaining thermal efficiency.

Growth and nutrition.

393. HERBST, W., AND WEGER, N. 634.1/7 : 581.145.1
 Zur Physiologie des Fruchstens bei den Obstgehölzen. V. Zur Möglichkeit
 einer Voraussage des Blühtermines bei den Obstgehölzen, ein Beitrag zum
 Problem der Temperatursummen. (The physiology of fruiting in fruit trees.
 V. Foretelling dates of flowering, a contribution to the problem of temperature.)
Forschungsdienst, 1940, **9** : 518-25, bibl. 3.

In studying the relation between temperature and blossoming time of fruit trees, the authors have proceeded on two assumptions: (1) that there is a threshold temperature, below which the development of flowers does not proceed; and (2) that the effect of temperatures in excess of this threshold value between midwinter and blossoming time is additive. For eighteen pear varieties the threshold temperature was determined by inspection of curves showing the dates of blossom opening in different years, and is given as 6° C., varietal differences being small. For five years hourly temperature readings were taken between 1 January and the mean blossoming date for the eighteen varieties; where these readings exceeded 6° C., the excesses over this figure were summed, giving the "effective temperature sum". For the four years 1935, 1936, 1938 and 1939 the mean of these values was 3,377 degree-hours, with a standard deviation of 68. For 1937 (a very late year), however, the value was 3,013. The authors claim that these observations may already be of practical value in a negative sense (making it possible to say that the trees will not flower before a certain date), and that with improved long-term weather forecasting an accurate estimate of the date of flowering some weeks in advance may be possible, which would be of considerable value in frost-protection and spraying operations. D.W.G.

394. PASSECKER, F. 634.21 : 581.45
 Jugend- und Altersform bei der Aprikose und anderen Obstarten. (**Youthful and mature forms in the apricot.**)
Gartenbauwirtsch., 1940, 14 : 614-25, from abstract *Forschungsdienst*, 1940, Vol. 10, abstr. p. 116.

Observations show differences in leaf form in the young and old apricot, the change taking place between the second and third years. The leaves of the young form are smaller and with shorter stalks, and are covered with soft hairs which give them a feeling of softness.

395. KRUFF, FR. 551.5 : 634.1/2-1.541.11
 Phänologische Beobachtungen bei Äpfeln. . . . (**Phenological observations on apples, pears, plums and sweet cherries at the Geisenheim Institute of Horticulture and Viticulture.**)
Deutsch. Obstb., 1940, No. 3, pp. 43-7, No. 4, pp. 68-9, No. 6, pp. 10-112 [sic], from abstract *Forschungsdienst*, 1940, Vol. 10, abstr. p. 116.

The author publishes his observations at Geisenheim on Rhine on the spring growth in 1937 up to the end of flowering of 153 apple, 110 pear, 61 plum and 41 cherry varieties, noting the dates at which the different stages were reached. He notes the different effects of environment and rootstock and urges the necessity for finding out particulars of growth of both stock and scion before grafting or budding in each case.

396. ÜLKÜMEN, L. 634.1/7 : 581.145.1
 Die Bedeutung des Termins der Blütenknospenausbildung für Ertragsfähigkeit und Erfolg von Kulturmassnahmen bei Obstgehölzen. Dargestellt an den wichtigsten Obstarten von Malatya. (**The importance of the date when flower bud formation ends to bearing capacity and cultural operations in fruit trees.**)
Gartenbauwiss., 1940, 14 : 169-220.

This study of the importance of fruit bud formation on yield was made on varieties of apple, pear and apricot growing in the Malatya district of Turkey. The development of the fruit buds is first described in detail. The results showed that the development of the fruit buds of the three kinds of fruit covered a fairly long period. The apple buds differentiated first about 20 June, followed by the pears and finally the apricots ending 30 July. No correlation could be found between the final maturity of flower and fruit on the one hand and the end of the formation of the flower bud initial on the other. In the arid districts the differentiation of the flower buds was relatively slow during the summer. Further development was dependent on the water supply during the autumn. R.M.I.

397. BELL, H. P. 634.11 : 581.144
 Winter growth in the vegetative buds of the Wagener apple.
Canad. J. Res., 1940, 18, Sec. C, pp. 585-90, bibl. 6.

Vegetative buds of the Wagener apple were collected from 26 September 1938 to 18 March 1939. The median longitudinal section of each bud was measured. The data collected suggested that a slow but continuous growth in length within the bud proceeds throughout the winter months. The figures were subjected to statistical analysis and found to be significant. [Author's summary.]

398. PASSECKER, F. 634.1/2 : 581.148.2
 Über den Laubfall unserer Obstbäume. (**Leaf fall in German fruit trees.**)
Deutsch. Obstb., 1940, No. 1, pp. 9, from abstract *Forschungsdienst*, 1940, Vol. 10, abstr. p. 116.

The author—on one year's observations—groups a number of apple varieties on Paradise stocks and pears on quince according to the time when they shed their leaves. Wood ripening seems to be correlated with the time of leaf fall and it is found that the best ripened shoots drop their leaves earliest.

Cultural practice.

399. ANON. 634.1/7-1.4

Soil management in orchards.

Mon. agric. Bull., Palestine, March 1940, pp. 92-5.

Instructions are given for the preparation for planting and subsequent management of orchard soils in Palestine, both in the plain and on the hillside.

400. HILDEBRANDT, B. 634.11-1.541.11-2.111

Und nun geht es wieder an die Arbeit. (**Practical points.**)

Deutsch. Obst., 1940, No. 8, pp. 143-5, from abstract *Forschungsdienst*, 1940, Vol. 10, abstr. p. 116.

The author suggests that in districts subject to very hard winters weak or medium vigorous apple varieties should be grown with the following intermediates as stembuilders:—Croncels, Antonovka, Titovka, Serinka, Fraas Sommerkalvill, Crabapfel; and vigorous varieties with Klarapfel as intermediate on seedling stocks.

401. BOWMAN, F. T. 634.1-1.55

Controlling the cropping of pome fruits. New practices needed.

Fruit Cult., N.S.W., 1940, 10 : 126 : 4, 22-3.

The control of alternate bearing of pome fruits is discussed. There is a critical time 30-35 days after full bloom when, if fruit setting is not excessive, the young growing spurs will develop towards blossom buds, but, if it is excessive, they will remain leaf buds. A special blossom and fruit thinning has been found effective. (1) Only one fruit is left to every six spurs throughout the tree. (2) Thinning can begin as soon as the fruit buds can be distinguished at bud burst and *must* be completed by 5 weeks after the date of full bloom. This pre-drop thinning must be heavy as well as early. Thinning for the control of cropping should not be necessary again until the tree suffers some check which disturbs the balance, such as thrips or frost. In two years the yield from two regular crops is about 50% higher than the yield from one heavy crop. Blossom reducing sprays such as Cresol 1% emulsified with soap, tar oil 2% or red oil 4% were tried with only moderate success. Red oil was comparatively ineffective and produced russetting of the fruit.

402. FISHER, D. V., AND BRITTON, J. E. 634.11-1.542.27

Thinning as a means of correcting biennial bearing in apples.

Sci. Agric., 1940, 21 : 105-14, bibl. 17.

In Summerland, B.C., blossom thinning and early extra heavy thinning treatments restored the regular annual fruiting condition in Newtown and Winesap apple trees. The condition has been maintained by thinning to one fruit per spur in subsequent years. Total yields have been greatly increased. With Newtown the size of the fruit was so greatly increased that it entered the unprofitable size grades. The practical value of thinning to promote regular annual bearing will depend on the optimum size of fruit desired in each variety.

403. WILCOX, J. C. 634.11 : 581.084.2

Adjusting apple yields for differences in size of tree.

Sci. Agric., 1941, 21 : 139-48, bibl. 14.

Studies were made of several possible methods of adjusting apple yields for differences in size of tree. The source of material for the studies was some 400 McIntosh trees in grower-owned orchards. The adjustment was too small when made to a constant trunk circumference, too large when made to a constant cross-sectional area of the trunk, and about right when made to a constant geometric mean of the circumference and the cross-sectional area. The most reliable method, however, appeared to be the use of the regression coefficient obtained from the regression of yield on size of trunk. Large differences in severity of pruning were found to lessen the reliability of the methods used for making the yield adjustments. The adjustments were found to be quite unreliable after the trees had started to crowd badly. The same was true where there were empty spaces or small trees adjoining the mature trees on which the records were being taken. It was found that with mature trees satisfactory results could be obtained only where each tree was surrounded by a full complement of other trees of the same variety and size.

Trees planted at different distances apart could not be compared with one another except by adjusting for both size of tree and distance of planting. A method is suggested for expressing the size of tree per unit area of ground occupied. [Author's summary.]

404. KESSLER, W. 634.11 : 577.16
Über den Vitamin-C-Gehalt deutscher Apfelsorten und seine Abhängigkeit von Herkunft. . . . (The vitamin C content of apples and its dependence on origin, light, manuring, crop and storage.)
Gartenbauwiss., 1939, 13 : 619-38, from abstract *Forschungsdienst*, 1940, Vol. 9, abstr. p. 48.

The material consisted of apples of some 30 German varieties, some of them from different localities. The improved Tilmann method was used for determining vitamin C content. Great differences were found in vitamin C content which was shown to be a definite inherited character. On the average the content was 10-15 mg. per 100 g. fruit including the skin. It is influenced by light, conditions of growth, place of origin, size of crop and manuring. For the conservation of vitamin C in apples, storage at temperatures below +5° C. is best. Considerable loss is experienced in non-refrigerated stores.

405. McWHORTER, O. T. 634.1/2-1.542
McWhorter explains proper pruning methods.
Better Fruit, 1941, 35 : 7 : 3, 6, 12.

406. REICHSNÄHRSTAND, BERLIN. 631.537 : 634.1/7 + 635.9
Verzeichnis der vom Reichsnährstand als marken-fähig anerkannten Baumschulen. Nach dem Stande vom 1 April 1940. (Official list of inspected and approved fruit and flower nurseries in Germany.)
Reichsnährstand Verl. G. m. b. H., Berlin, 1940, pp. 77. From *Forschungsdienst*, 1940, Vol. 10, abstr. p. 65.

SMALL FRUITS, VINES AND NUTS.

407. FÜRTAUER. 634.7-1.531
Keimungsförderung von Beerenobstsamen. (Aids to germination of small fruit seeds.)
Gartenbauwiss., 1940, 14 : 141-50, from abstract *Forschungsdienst*, 1940, Vol. 9, abstr. p. 123.

Difficulty in germinating the seed of small fruits led to further experiments at Münchenburg. Some 300,000 seeds of various *Rubus* and *Ribes* species were treated in different ways before being submitted to germination tests. Stratification in leaf and leaf mould gave a higher germination in the second year than stratification in sand. Immediate removal of the seeds from the fruit by washing followed at once by stratification, which was tried in the third year, resulted in better germination and initial growth. Drying the seed even temporarily during storage causes the greatest number of subsequent failures, however carefully the stratification is carried out.

408. SCOTT, G. W., AND MACGILLIVRAY, J. H. 635.615 : 581.192
Variation in solids of the juice from different regions in melon fruits.
Hilgardia, 1940, 13 : 69-79, bibl. 13.

Trials show that the different regions in individual fruits of the water melon vary in composition. The two best ways of obtaining a reliable sample are :—Press the juice from all the edible flesh, being careful to remove a uniform percentage of the flesh or (2) press the juice from a longitudinal segment, being careful to remove a uniform percentage of the flesh. Storage for 6½ days slightly changes composition.

409. PORTER, D. R., BISSON, C. S., AND ALLINGER, H. W. 635.615 : 581.192
Factors affecting the total soluble solids, reducing sugars and sucrose in water-melons.
Hilgardia, 1940, 13 : 31-66, bibl. 11.

Factors discussed are variety, ripeness, storage and environment. The desirability of inbreeding to eliminate low-sugar individuals and to stabilize the remainder is indicated.

410. TEODORESCU, I. C. 634.8
 Clasificarea si recunoasterea soiurilor de vite roditoare din podgoriile romanesti.
 (Classification and recognition of fertile varieties of vine in Rumanian vine-
 yards.) [French summary.]
Anal. Inst. Cerc. agron. Român., 1940, 11 : 222-37.

The author describes in detail a key to the identification of vine varieties based on the following characteristics:—(1) colour of grape, (2) shape of bunch, (3) shape of seed, (4) taste of flesh, (5) shape of leaf, (6) form of bud, (7) form of leaf, (8) type of flower, (9) colour of shoot. Most of these characteristics are further differentiated. Thus colour of grape is described as white, red and black and in each case the juice may be coloured or uncoloured. The leaf is described as 3-lobed, 5-lobed or 7-lobed.

411. ORAMAN, N. 634.8
 Die Voraussetzungen für den Weinbau im Trockengebiet Zentralanatoliens.
 (Provision for vine growing in the dry districts of central Anatolia.)
Gartenbauwiss., 1940, 14 : 221-307.

The geography of the dry district in central Anatolia is first described, and this is followed by an account of the climate and the special advantages of the region for wine production. Details are given of 73 of the varieties grown, with special reference to their drought resistance. Experiments, using Buchinger's methods of plasmolysis, are described. With a view to improving the quality of the product, the biology of the flowers and fruit is considered in some detail, as well as the maturity and resistance of the grapes. An account is given of the technique of vine cultivation in the district. R.M.I.

412. COUPIN, A. 634.8-1.541.11
 La plantation d'un vignoble avec des plantes américains. (Planting a vineyard
 with vines on American stock.)
Tunisie agric., 1940, 41 : 161-70.

Instructions are given for laying out and planting a vineyard under Tunisian conditions. There is considerable discussion as to the relative merits of buying already grafted plants or grafting the stock in the field. The latter method is the cheaper at the outset though possibly, in view of after care and failures, not in the long run. The former method is the safer. Evidence is brought to show, however, that stocks containing Berlandieri blood lend themselves very successfully to grafting in the field and if these stocks are used the method is worth a trial.

413. MÜLLER-STOLL, W. R. 634.8-1.541.11 : 577.15.04
 Weitere Versuche über die Verwendbarkeit von Wuchsstoffen in der Reben-
 veredlung. (Further experiments on the use of growth substances for vine
 grafting.)
Gartenbauwiss., 1940, 14 : 151-68.

The author continues his investigations on the effect of solutions of heteroauxin on increasing the growth of vine grafts. A considerable increase in growth can be obtained by the spraying of the bundled grafts with a solution of heteroauxin as well as by a short immersion of the cut surfaces of both graft partners before they are combined, provided suitable conditions are selected. Phenylacetic acid is also known to afford a valuable means for increasing the percentage swelling of the grafts. The addition of saponin and adhesive paste was found to be injurious. It was found that immersion of the ends of both the scion and the stock in a very dilute solution of the growth-promoting substance for 16-20 hours had a good effect on subsequent growth. There is a correlative connexion between root formation and the delay of shoot production after treatment with heteroauxin. If the humidity is too high in the packing of the grafts, root production is undesirably pronounced, but this can be avoided to a large extent by drier conditions. Contrary to the results of other authors, a strong, even ring of callus tissue forms at the grafting place after treatment with heteroauxin solution. R.M.I.

414. CAPUCCI, C. 634.8-1.541
Alcune osservazioni sull' innesto erbaceo per copulazione semplice dell' internodo delle vite. (Some notes on a type of herbaceous whip grafting for vines.)
Riv. Frutticoltura, 1940, 4: 65-96.

The experiments were made on vines in the Romagna and Bologna districts in the years 1936-1939. The form of grafting is recommended for the provinces of Bologna and Ravenna because of the excellent conditions for growth. The results are only satisfactory if carried out on vigorous plants prepared during the resting period, leaving to each a single branch, and during weather that is not too windy or rainy and with neither too high nor too low temperatures. The method is especially recommended for European vines on Kobel 5 BB stocks. R.M.I.

415. TEODORESCU, I. C. 634.8-1.542
Taerea ca factor de productiune in viticultura. (Pruning as a production factor in viticulture.) [French summary.]
Anal. Inst. Cerc. agron. Român., 1939, 11: 188-221.

Pruning experiments with known varieties of grape on known rootstocks at the experimental vineyard of Pietroasa-Buzau in collaboration with the Rumanian Institute of Agricultural Research during the years 1933-1938 and observation on the effect of soil and climate both at Pietroasa-Buzau and Diosig-Bihor showed that the degree of alcohol in the grape was most affected by the identity of the scion variety, with a range of 7.12° between extremes. The second most important factor was climate and soil, the alcohol extremes ranging from 17.1 at Pietroasa-Buzau to 11.2° at Diosig-Bihor. Pruning came third showing a range of 4.4°, while rootstock effect resulted in a range of only 2.7°. Acidity was affected relatively in the same way.

416. TEICHMANN, L. 634.8
Die Anwendung des Zeisschen Handzuckerrefraktometers in Weinbau. (The use of the Zeiss hand sugar refractometer in viticulture.)
Züchter, 1940, 12: 237-43.
417. BROOKS, R. M. 634.55
Comparative histogenesis of vegetative and floral apices in *Amygdalus communis* with special reference to the carpel.
Hilgardia, 1940, 13: 249-306, bibl. 114.

Marked histogenetic differences between leaf and flower buds in the almond (*Amygdalus communis* L., horticultural variety Nonpareil) apparently shed light upon the general problem of carpel morphology in the Angiospermae. The apex of the leaf bud exhibits a four-layered tunica in contrast to the two tunica layers characteristic of the floral apex. The structure of the corpus is similar in both types of buds. A week before the formation of the calyx, the form of the apex of the flower bud changes gradually from a broad dome to an elongated structure with a flat top and vertical flanks. During this change in external form the biseriate tunica is reduced to a single layer. The foliage leaf primordium is derived from cells in the tunica, whereas all internal tissue of the floral organs originates from the corpus. Cataphylls, foliage leaves, sepals, petals, and stamens originate as lateral members at the sides of the apex. In contrast, the entire apical region of the flower bud produces the carpel primordium. Histogenetic evidence fails to support the classical interpretation that the carpel is homologous with a foliage leaf. It is concluded that from a developmental standpoint, the carpel is a distinct and unique organ among living angiospermous plants. Broad comparative histogenetic studies are urgent in order to test this interpretation. [Author's summary.]

PLANT PROTECTION OF DECIDUOUS FRUITS.

418. KIVILAA, A. 634.1/7-2.111
Kümakahjustustest ja nende voimalike tagajärgede pehendamise võimalustest viljapuuadades. (Frost damage and its possible effects on fruit yields.)
[Summary (incomplete) in German in No. 6, p. 476.]
Agrooomia, 1940, No. 5, pp. 315-9.

The winter of 1939-1940, which was the most severe for 80 years, with a temperature of -40° C. in some places, proved to be disastrous in Finnish orchards. Extreme cold lasted from December

to March. In the orchard of the Experimental Station of the University of Tartu all pears, plums and cherries, including some new Russian varieties, were destroyed, regardless of variety and age of trees. Of 148 varieties of apples 74% were completely destroyed, while 26% proved to be more resistant to frost. The following remained unaffected:—Hyslop, *Malus baccata praecox*, and a *Malus prunifolia* crab-apple. The following suffered slightly:—Antonovka, Borovinka, Jahontovoje, Koritschnevoje, Lithuanian sweet apple, Livonian Golden Pippin, *Malus silvestris*, Säftaholm, and Weisser Klarapfel. The following Mitschurin varieties suffered comparatively slight damage:—Arcad zimnii, Bessemjanka Mitschurina, Kitaika zolotistaja. Berry fruits suffered slightly or not at all. The author advises immediate treatment of partially damaged trees in the spring as follows:—1. Impede flow of sap to damaged branches, thereby assisting sound branches. 2. Apply soft soap to damaged parts, in order to prevent formation of fungus and development of diseases in the trunk. 3. Promote restoration of tree by exterminating pests.

419. HILDEBRANDT, B. 634.11-2.111
 Frosthärte und Abstammung. (Winter hardiness and origin.)
Deutsch. Obst., 1940, No. 6, pp. 101-3, from abstract *Forschungsdienst*, 1940,
 Vol. 10, abstr. p. 117.

In 1900 a collection of apples was planted at Tapiau, East Prussia. The winters of 1928/29 and 1939/40 proved a good test of winter hardiness. The collection included the following:—(1) *Malus baccata*, particularly the *sibirica* forms *aurantiaca*, *genuina*, *microcarpa*, *praecox*, *sphaerocarpa*. (2) *M. prunifolia* (*baccata* × *pumila*), *maliformis*, *pendula*. (3) *M. cerasifera* (*baccata* × *prunifolia*), *hiemalis*, *jenensis*, *oblonga*, *sibirica* fructu *coccinea*. Of the American crabs which are closely related to this group the vigorous forms Transcendent and Virginia remained unharmed. Both forms gave very vigorous seedlings. The following cultivated varieties are closely related to them:—Klarapfel, Filippas Apfel, Prinzenapfel aus Croncels, Early Victoria, Marienwerder Gulderling, Charlamowsky, Signe Tillish, Creole, Cellini and Hawthornden. All of these stand the hard continental winter well, alternating snow and hard frosts providing the severest test. The types of continental Europe are more hardy than those from the Atlantic regions. The smooth-budded types from western Germany are particularly susceptible, among them Bohnapfel, Allington Pippin, Kassler Reinette, Danziger Kantapfel and Kaiser Wilhelm. Those with a liberal share of *pumila* blood are particularly susceptible. The very vigorous *coronaria-ioensis* types are extremely cold resistant. Early McIntosh, Grimes Golden and Wealthy being partly derived from these types are hardy. *Malus-pumila* types and their descendants, including the doucin and paradise group, are noticeable for the hairiness of their buds and shoots; they come from warmer lands. Varieties with very hairy buds are susceptible to cold. Varieties with a lighter coloured bark (Roter Eiseraffel, Ulhorn's August-Kalvill, etc.) are less subject to damage than Belle de Boskoop, Ananasreinette, Cox's Orange Pippin, Ontario and others with a darker bark. Susceptibility in the East Malling and Pillnitz types varies with the scion variety.

420. RUDOLF, W. 634.1/2-2.111-1.523
 Die Züchtung frostresistenter Obstsorten mit besonderer Berücksichtigung
 der Resistenz gegen Spätfrostschäden. (Breeding for frost resistance in fruit
 trees especially resistance to late frosts.)
Forschungsdienst, 1940, 9 : 266-76, bibl. 10.

After a general survey of the factors which appear to influence frost resistance in fruit trees the author gives data of preliminary results of investigations at Müncheberg into the frost resistance of the following varieties of fruit:—Apples Antonovka, Geheimrat Oldenburg, Königl, Kurzstiel, Belle de Boskoop and plums *Prunus spinosa*, Hauswetsche, Frühe Fruchtbare (70 seedlings) and Shiro (a particularly susceptible type). Flowering branches of these in different stages of development were submitted to different degrees of cold for different lengths of time and allowed to thaw at low temperatures. The macroscopic and microscopic results of the treatment are given here. It is thought that there should be no great difficulty to the breeder in achieving crosses which show the desired combination of late flowering and early ripening characters.

421. REED, H. S. 581.144 : 632.19 : 546.47

Effects of zinc deficiency on cells of vegetative buds.

Amer. J. Bot., 1941, **28** : 10-7, bibl. 6.

Studies on the cytology of the apical meristem of shoots from healthy and affected apricot and peach trees indicate that the chief effects of zinc deficiency (little-leaf disease) appear to be reflected in the condition of hypoplasia created, the polarization of cell contents and the inhibition of cell multiplication in the apical region. The accentuated accumulation of phenolic substances in the vacuoles resulted in increased cell size and was never associated with necrosis. It is probable that certain phenolic compounds were utilized in metabolism.

422. FAWCETT, H. S. 632.8

Suggestions on plant virus nomenclature as exemplified by names for citrus viruses.

Science, 1941, **92** : 559-61, bibl. 10.

A system for naming plant viruses is proposed which the author considers combines the best features of Johnson's, Smith's and Holmes's proposals. Briefly it is to continue the use of binomials but to form the generic name by adding "*vir*" for virus (Latin neuter) to the genitive of the genus of the host in which the virus was first discovered and recognized, dropping any final consonants that occur in the genitive. Thus the peach rosette virus would become *Prunivir rosettae* and the raspberry streak virus *Rubivir orientale*. The generic name thus conveys that it refers to a virus and that it was first recognized and shown by transmission to be a virus in a particular genus of plants. The author demands that the transmissibility of a suspected virus be proven before it is received into the fold and named. The paper concludes with a list of six advantages provided by this system and gives a list of the designations proposed for citrus viruses at present recognized. There is a short note on suspected viruses in citrus, namely, concave gum, blind pocket, crinkly leaf of lemon and infectious variegation, all believed to be varieties of the psorosis virus or *Citrivir psorosis*.

423. SELMAN, I. W. 632.8

Control of plant virus diseases by cultural methods.

Nature, 1941, **147** : 181-2.

Work at the Cheshunt Research Station on the interaction of environmental factors on the virus diseases of glasshouse plants has shown that such interactions do exist, that frequently a relative deficiency of some essential element will accentuate the metabolic effects induced by the virus and that an infected crop can often be saved from complete failure by proper cultural treatment. Some examples of this are considered.

424. COLE, C. E. 634.11-2.8

Leaf variegation of the apple.

J. Dep. Agric. Vict., 1941, **39** : 141-2, bibl. 1.

Leaf variegation of apple is very common in the orchards of Victoria. It is harmless, although affected leaves seem especially susceptible to spray damage. The amount of variegation of any one tree is not constant from year to year and the varieties of apple differ in susceptibility. Jonathan is the most generally affected variety. In very severe cases the fruit also is occasionally marked. Grafting and other experiments indicate that the disease is due to a virus and is not readily transferred by pruning or insect vectors.

425. HOCKEY, J. F. 634.11-2.8

False sting—a virus disease of apples.

Sci. Agric., 1941, **21** : 242-3.

Malformation of apples not due to insect attack has been observed in Nova Scotia. The disease has a superficial resemblance to stoney pit of pears, although no characteristic foliage or bark symptoms have been observed. Experiments showed that the condition is probably due to a virus disease which can be transmitted by grafting.

426. (DU PLESSIS, S. J.) 634.8-2.314
Bacterial blight of vines in South Africa.
Fmg S. Afr., 1941, 16 : 59, 76.

This paper summarizes *Sci. Bull. S. Afr. Dep. Agric.* 214. The "blight" manifests itself by black discolourations and cracks along the length of shoots, branches and stalks of bunches and leaves. Young growth becomes subnormal with characteristically short internodes and long, poorly filled bunches. The leaves partially wither into various reddish brown-yellow shades as a result of interrupted sap flow and direct infection on the leaves causes spotting. The causal bacterial organisms were studied and renamed *Erwinia vitivora* (Bacc.) du P. Infection of all parts but the leaves is mainly through wounds and the disease thereafter spreads through the vascular tissues. The causal bacterium overwinters in the infected parts whence it spreads to the younger portions of the vine so that control by spraying or dusting is of little use, though it is suggested that a copper sulphate solution 1 lb. to 1 gall. of water might be sprayed after leaf fall. Other measures aim at guarding the vine from injury by careful cultivation and disinfection of pruning cuts. The removal of badly infected trees and the burning of infected material is also advocated.

427. HOLZ, W. 632.42 : 634.11
 Fortschritte in der Bekämpfung von *Fusicladium dendriticum* mit chemischen Mitteln in den Jahren 1936-1938 (II). (**Progress in apple scab control methods in 1936-1938.**)
Forschungsdienst, 1940, 9 : 278-88, bibl. 42.

Considerable attention is now being paid to the control of the perithecial stage of the apple scab fungus. Keitt and Palmer in U.S.A. achieved a reduction of fruit infection from 99% in untreated orchards to 55% by spraying the leaves in the trees in autumn with bordeaux arsenic mixtures. The perithecia on the ground were effectively killed by the use of ammonium sulphate 1 lb. to 1 gall. water. Holz has himself had complete success with calcium cyanamide in the orchard. It is not suggested that such treatment will ever do away with the necessity for summer spraying but only that it will be a great help in the control of scab.

428. HERBST, W., AND RUDLOFF, C. F. 632.42
 Der kleine Jahreskreislauf und seine Bedeutung für die Schorf-Epidemie bei den Obstgehölzen. (**The importance of the wholly parasitic life cycle of *Venturia* to scab incidence in fruit trees.**)
Forschungsdienst, 1940, 10 : 80-8, bibl. 32.

The authors consider that the importance of the form of *Venturia* which overwinters in the form of mycelium in the leaves or twigs of the host plant should not be underestimated. It has been a fault in the past to consider only the saprophytic form as of primary importance in carrying on the existence of the fungus and to neglect the evidence available that very severe scab attacks may arise purely from the revival of the parasitic form in spring without any intervention of the saprophytic ascospore stage. Work by different authorities on the parasitic stage is briefly discussed. As regards control it is suggested that a certain amount of control can be achieved by careful pruning. Further figures are given of a fair measure of success achieved by covering the infected trees with fishing nets treated with 20% bordeaux mixture. It was found that following such treatment rain, which normally leads to an outbreak of scab, also leads to a release of the fungicide and prevention of the threatened outbreak.

429. JONES, S. C., AND MOTE, D. C. 634.22-2.73
Prune thrips controlled by properly timed sprays.
Better Fruit, 1941, 35 : 8 : 4, 19, reprinted from *Circ. Information Oregon St. Coll. No. 214*.

Control of the pear thrips on prunes is obtained by either of the following sprays. (1) Oil emulsion, viscosity 70-75 seconds Saybolt ; unsulphonated residue test of 90%, diluted to give 2% actual oil ; and nicotine sulphate 40% 1 pint, water to make 100 gal. (2) Lime-sulphur 3 gal., nicotine sulphate 40% 1 pint, water to make 100 gal. First application when 30%-40% blossom buds show green at the tips, second when all the blossom buds show green at the tips and third when the blossom buds show white at the tips. Oil should not be used if lime-sulphur

is to follow later. The most pronounced injury is caused when the thrips enter the buds early in the season. The blossom stems become devitalized and fail to lengthen. The blossom opens only partially or not at all and soon falls. An infested orchard takes on a brownish burnt appearance. Flowers which escape injury in bud are injured later in the stamens and pistils and fail to set fruit.

430. HUSAIN, M. A., AND KHAN, M. A. W. 634.38-2.76
Bionomics and control of the fig-tree borer, *Batocera rufomaculata* De Geer (*Coleoptera: Lamiidae*).
Indian J. agric. Sci., 1940, 10 : 945-59, bibl. 18.

The fig tree borer, *Batocera rufomaculata* De Geer, is a very serious pest of fig trees in India. As an example, of fifty-three fig trees planted in 1925 at the Lyallpur Experimental Orchard only three had by 1932 survived the attacks of this borer. The life history is described and illustrated. Control measures consist in protecting the stem with coal tar-painted paper or 1/16 inch mesh wire gauze, in spraying the stem and main branches with repellent mixtures (about 5 sprayings were necessary) and by killing young larvae by injecting kerosene oil or chloroform creosote mixture into the holes from which frass is coming or by cleaning the tunnel and plugging it with kerosene oil and finally plastering the hole with mud. The egg-laying period extends from May into November.

431. ANON. 634.16-2.77
Fruit flies (*Trypetidae*) in loquats.
Agric. Gaz. N.S.W., 1940, 51 : 568.

This paper outlines the measures to be used in New South Wales against fruit fly when the loquats are ripening. All infested fruit must be removed from the trees and destroyed every three days. Citrus fruits often act as hosts for an early build-up of fruit fly in the spring and should not be overlooked. All loquats grown in the coastal area of N.S.W. must be off the trees by 31 October. One trap to every 8 trees must be used, the prescribed lure being—essence of vanilla $\frac{1}{8}$ fluid oz., household ammonia $\frac{1}{2}$ fluid oz., water 26 fluid oz. Two poison baits are recommended for application to the foliage, consisting of either sodium fluosilicate 2 oz. or tartar-emetic 2 oz., with white sugar $2\frac{1}{2}$ lb. and water 4 gallons in each case.

432. LASAROFF, A. W. 634.1/7-2.78
 Beitrag zur Biologie und Bekämpfung der im Obstbau schädlichen Sackträgermotten (*Coleophora coracipennella* Hb., *C. hemerobiella* Sc. and *C. anatipennella* Hb.). (**Biology and control of *Coleophora* spp. in the orchard.**)
Gartenbauwiss., 1939, 14 : 77-140.

Details are given of the morphology and biology of the species mentioned. With regard to control measures for *coracipennella* larvae, a solution with a dinitro-o-cresol content of 0.4-0.5% is recommended for winter use. For summer, even highly increased concentrations of nicotine and derris-pyrethrum containing substances have not proved satisfactory. R.M.I.

433. WEBSTER, R. L., MARSHALL, J., AND FALLSCHEER, H. 632.78
The present status of organic insecticides for codling moth control.
J. econ. Ent., 1940, 33 : 909-12, bibl. 1.

The author discusses results achieved against codling moth with nicotine combinations, nicotine-oil, nicotine-molasses, nicotine-bentonite, pyrethrum extracts, phenothiazine and Genicide. Trials of pyrethrum extracts usually combined with mineral oil have not been encouraging nor have trials with phenothiazine. Xanthone in the form of Genicide has given better results. Although, moreover, lead residue troubles can be eliminated and comparative freedom from foliage and fruit injury obtained by the use of nicotine, it has to be used in such quantities as to eliminate any economic gain under Washington conditions of high infestation.

434. GRAHAM, L. T., AND RICHARDSON, C. H. 632.78
Calcium arsenate and lead arsenate sprays with soybean flour for codling moth control.
J. econ. Ent., 1940, 33 : 862-5, bibl. 15.

Under Iowa conditions calcium arsenate sprays safened with ferrous sulphate controlled first brood codling moth about as well as lead arsenate. They were found not to injure apple foliage.

The effect on control of adding soybean flour to calcium or lead arsenate sprays (12 oz. to 100 gal. spray) was nil.

435. MARANI, M., AND OTHERS. 632.78
 Ricerche sull' efficacia dell' arseniato di alluminio nella lotta contra il verme delle mele (*Laspeyresia pomonella* L.). (**Arsenate of aluminium for control of codlin moth.**)
Riv. Frutticoltura, 1940, 4 : 57-63.

Comparative tests were made of the efficacy of neutral aluminium arsenate and acid lead arsenate both in the form of powder, for the control of codlin moth on Rome Beauty and Abbondanza apple trees. The authors' observations confirm the view that the first of these varieties is fairly susceptible and the second resistant to the pest. The treatment was applied at intervals, five times between 10 May and 12 August. The results showed that for practical purposes the use of aluminium arsenate is almost as effective as that of acid lead arsenate. R.M.I.

436. BURKHOLDER, C. L., JOHNSON, D. L., AND FORD, O. W. 632.78
Two years' results with codlin moth sprays.
J. econ. Ent., 1940, 33 : 713-7, bibl. 1.

The experiments were carried out at the Purdue University's orchard at Bedford, Indiana. The orchard is situated in the 3-brood codlin moth belt where a combined attack of late second-brood and third-brood worms has been very difficult to control from August to harvest. The application of more than 4 first-brood lead-arsenate cover sprays containing oil caused severe foliage injury, fruit russet and reduction in fruit size especially on Jonathan and Grimes. Good control has been secured in recent years by a maximum for 4 first-brood cover sprays but seems dependent on other factors such as size of codling moth population, pruning to facilitate special coverage of top third of tree and packing-shed sanitation. A factory-mixed nicotine-bentonite-oil gave good control but required more frequent applications. A successful control with negligible foliage injury was obtained when the first broods were attacked with nicotine-bentonite-oil with one or two lead-arsenate sprays during the latter part of the fruit development period. It was shown that a heavy and effective lead-arsenate film could be produced by one spray applied when the apples had reached a size of 7-10 fruits to the pound. A rapid washing treatment at packing-shed temperature brought both arsenic and lead loads to tolerance on the fruit from the split treatment plots.

437. MARTIN, J. T. 632.951.1
The chemical evaluation of pyrethrum flowers (*Chrysanthemum cinerariaefolium*). The extraction of the flowers for analysis and the preparation of colourless concentrates of the pyrethrins.
J. agric. Sci., 1941, 31 : 178-85, bibl. 9.

1. Biological trials have been carried out to determine the efficacy of petroleum ether as solvent for the extraction of pyrethrum flowers for analysis. 95% of the toxic material was extracted from flowers one year old after only 3 hr. percolation. An extraction period of 8 hr. with petroleum ether is suggested. 2. A method of preparing colourless extracts of pyrethrum and analytical data for such extracts are given. They are shown to be of value for the preparation of concentrates of the pyrethrins. The preparation of a colourless concentrate containing 93% of total pyrethrins, as determined by a modified Seil method, is described. [Author's summary.]

438. ANON. 632.951
A new insect poison.
Science, 1940, Vol. 92, supplement p. 10.
 SWINGLE, W. T., AND OTHERS.
A Chinese insecticidal plant, *Tripterygium wilfordii*, introduced into the United States.
Science, 1941, 93 : 60-1.

In the first of the above notes it is stated that cuttings of *Tripterygium wilfordii*, a relation of American bittersweet (*Celastrus scandens*) have been sent from China and are now being grown at the U.S. Department of Agriculture's introduction garden at Glenn Dale, Maryland. The insecticidal substance is found in the bark of the roots and has long been used in China.

In the second brief article it is shown how in Chekiang Province, China, soil deterioration as the result of loosening caused by the removal of the roots of this plant, commonly known as lei kung t'eng, led to the writing of many papers on its merits and demerits. It appears that the powder derived from it deteriorates rather quickly and at present investigations are being made with various extracts from the plants grown at Glenn Dale. Here preliminary results are noted with root powder from 4-year-old plants on a number of lepidopterous larvae including those of the codlin moth. They warrant a detailed chemical study of the plant extractive. This is in progress and an account together with details of the toxicity of its various fractions is promised shortly.

439. SMITH, C. F. 632.951 : 632.653/4
Toxicity of some nitrogenous bases to eggs of *Lygaeus kalmii*.
J. econ. Ent., 1940, **33** : 724-7, bibl. 10.

Of a number of compounds tested in laboratory experiments quinoline alone killed the eggs of the plant bug, *Lygaeus kalmii*, immediately. Nicotine, piperidine and anabasine did not check development of the embryos for some days but those which hatched died soon afterwards.

440. FISHER, R. A. 632.951
Insecticidal action of extracts of *Veratrum viride*.
J. econ. Ent., 1940, **33** : 728-33.

Veratrum viride Ait. (green hellebore) native of U.S.A. contains alkaloids very toxic to a number of insects. Standardization of the drug should be based upon the fraction of alkaloids soluble in ether and not upon the total alkaloid content, since the fraction of alkaloids insoluble in ether is non-toxic.

441. WATT, A. S. 632.54
Contributions to the ecology of bracken (*Pteridium aquilinum*). I. The rhizome.

New Phytol., 1940, **39** : 401-22, bibl. 14.

- STOREY, H. H. 632.8 : 632.6/7
Investigations of the mechanism of the transmission of plant viruses in insect vectors. III. The insect's saliva.

Reprinted from *Proc. roy Soc. London Ser. B*, No. 849, Vol. **127**, 1939, pp. 526-43.

- MORRIS, V. H., NEISWANDER, C. R., AND SAYRE, J. D. 632.654.2
Toxicity of selenium-containing plants as a means of control for red spiders.
Plant Physiol., 1941, **16** : 197-202, bibl. 6.

VEGETABLE GROWING, OIL PLANTS, ETC.

442. ANON. 635.1/7
War-time production of vegetables in allotments and gardens. General information on plans for surplus production and marketing.
Publ. Sussex County Council, Lewes, 1941, pp. 4.

Gives information on the growing and marketing of vegetables reputed to be easily marketable in wartime, namely potatoes, onions, shallots, carrots, peas and haricot beans.

443. GREEN, D. E. 635.1/7 : 632.3/4
Hygiene in the wartime vegetable garden.
J. roy. hort. Soc., 1941, **66** : 28-33, 56-61, 91-6, 130-6, 168-73.

The first 5 papers of a monthly series of articles describing the diseases and methods of their control of the more important vegetable crops. Those dealt with so far are Parts I and II potatoes, III brassicas and peas, IV broad beans and celery, V tomatoes.

444. PYKE, M. 635.1/7 : 577.16
Vegetables as food.
Nature, 1941, **147** : 513-4.

The cabbage is a good source of vitamin C, yet much is wasted and only 17% of the original content arrives at the table. If the dish is kept hot even this disappears. The percentage of

loss occurring at the various stages of the progress from field to table is traced. In canning the loss is equally serious chiefly because of the process of blanching. A list of vegetables in their order of protective food value is given as follows :—Broccoli tops (of the exact meaning of which there is some doubt), watercress, mustard and cress, brussels sprouts, spinach, cabbage and cauliflower. The two last, however, are deficient in carotene. Vegetables one-fifth as concentrated as the greens are turnips, green peas, radish, leeks, parsnips, string beans and onions. Asparagus,* cucumber, celery and marrow are so deficient in vitamins or minerals as to be not worth grading. The carrot is discussed separately. It contains as much carotene as an equal weight of boiled brussels sprouts or less than half that in spinach, watercress or broccoli, 5% of the vitamin C in green vegetables and a fraction of their available iron and calcium. Some evidence is brought to show that the full vitamin A requirements of the body could, if necessary, be supplied by green vegetables. In wartime practically the whole dietary requirement of vitamin C must be supplied by green vegetables. Constant investigation, inspection and analysis at every point must be organized to ensure that the necessary daily supplies of vitamin C are consumed, especially in any form of communal feeding, e.g. military catering.

445. HAWTHORN, L. R.

635.1/7

Vegetables in Texas.

Rural New Yorker, 1941, 100 : 114, 122.

An account of the vegetable growing industry in Texas. Vegetables are grown on a huge scale to supply the northern and eastern markets during the spring and winter months. Comparisons are made between Texas conditions and those prevailing in the colder parts of U.S.A. *Tomatoes* only fruit for a short period in June or into July and then cease bearing till late October or early November. Only two or three pickings are usual from the late crops and the yield may be from 1 to 5 tons per acre. The varieties grown are Marglobe, Rutgers and Stokesdale in ascending order of yield. *Spinach* is a speculative crop the price depending on conditions in the many other spinach-producing districts in U.S.A. Savoyed varieties such as Dark Green Bloomsdale are the principal types grown. *Onions* are grown in large acreages but are mainly confined to two types, Yellow Bermuda and Crystal Wax, for the sole reason that none of the northern types will bulb in South Texas on account of the shorter day-length. Not only in onions but with most other vegetables grown there is only a limited choice of suitable types, since most vegetable varieties have been evolved under northern and colder conditions.

446. KUSMITSCHewa, T. G.

635.1/7 : 631.531

The influence of size of seed on crop increase and early ripening in vegetables.

[Russian.]

Owoschtschewodstwo, Moscow, 1939, No. 1, pp. 32-4, from abstract *Forschungsdienst*, 1940, Vol. 9, abstr. p. 48.

The author found in his investigations that vegetable plants derived from large seeds grew more quickly, ripened earlier, and gave a better crop over a given area. Crops fell in every case when seeds of the following diameter or less were used :—cabbage, cauliflower and cucumber 1.25 mm., radish 2 mm., carrot 1 mm., turnips 0.8 mm. The differences in crop obtained were very small in carrots and turnips but particularly large in radishes. The germination was also better from large seeds in cucumbers.

447. REINHOLD, J.

635.1/7 + 635.9

Ein Beitrag zur Bestimmung der Qualität von Gartenbauerzeugnissen insbesondere der durch die Sinne wahrnehmbaren Qualität. (**The determination of quality in garden products [vegetables and flowers] especially that which can be appreciated by the senses.**)

Forschungsdienst, 1940, 10 : 281-93, bibl. 5.

The author describes methods whereby vegetables and flowers subjected to various treatments or, it may be, merely different varieties can be satisfactorily judged for their qualities of appearance, taste and aroma or smell. Ways of eliminating personal error are noted and evaluation is based on marks given as the result of appreciation by clear thinking individuals. Examples are given with cabbage, turnip and *Erica gracilis*.

* See, however, 471.

448. SCHUPAN, W. 635.1/7 : 631.8
 Alleinige Stallmistdüngung oder Stallmist + zusätzliche Mineraldüngung in
 Gemüsebau? (**Manuring of vegetables. Farmyard manure alone or farm-
 yard manure plus artificials?**)
Forschungsdienst, 1940, 9 : 323-32, bibl. 6.

Experiments on the manuring of tomatoes and carrots on the Diedersdorf grounds of the Gross-beeren Institute since 1936 are here described. Analysis of the loamy sand (lehmiges Sandboden) soil before the trial showed a very small organic content. The pH was 6.1 in 1936 and 5.7 in 1937. Available potash was rather low, while phosphate was plentiful. The treatments given were (1) no manuring, (2) farmyard manure 6 kg. per square metre, (3) farmyard manure 6 kg. + artificials 8 g. N, 8 g. P_2O_5 , 12 g. K_2O , and (4) artificials, viz. 10 g. N, 10 g. P_2O_5 and 16 g. K_2O . Each treatment was repeated 6 times. The highest yields of tomatoes throughout the cropping season were afforded by the F.Y.M. (farmyard manure) + artificials plots. In carrots the yield was only very slightly better from the F.Y.M. + artificials plots. As regards carotene content, however, the difference in both vegetables was very markedly in favour of the F.Y.M. + artificials plots. Moreover results of feeding experiments at children's homes with the vegetables from the different plots entirely confirmed the results of chemical analysis with regard to carotene (provitamin A) and also proved that the vitamin C content was also greater from the same plots. In addition to being submitted to blood tests the children were weighed and again the vegetables from the F.Y.M. + artificials proved the best. [It would have been interesting if further treat-ments had been tested, especially F.Y.M. + F.Y.M. or artificials + artificials. Was the better result due to the increased amounts of N, P and K or to the fact that they were given in the form of artificials?—ED.]

449. BEWLEY, W. F. 631.544
Glasshouses to free ships.
Fruitgrower, 1941, 91 : 201.

The rôle of glasshouses in the production of food in wartime is important and it is briefly shown here how best they may be employed. The author calls attention to the great success obtained with the Cheshunt Early Giant lettuce as a glasshouse crop for tomato growers. He is the more satisfied since, when the research station of which he is Director first introduced it, tomato growers gave it little encouragement on the ground that lettuce could not be grown in that area. The chief need, however, is tomatoes and in this article special attention is paid to the production of late crops both for the specialist and the florist who is turning his bedding plant houses over to tomatoes.

450. SHEWELL-COOPER, W. E. 631.544.1
Continuous cloches for commercial work.
Fruitgrower, 1941, 91 : 204-5.

Some instructions are given on the growing of vegetables commercially under the continuous cloche, a misleading name which the author considers should be replaced by that of "glass tent". The most suitable crops are lettuces, broad beans, French beans, peas, carrots, beet, turnips and radishes. Seed for later transplanting can be raised under the cloches, onions having been very successful. Tomatoes can also be grown. The tomato plants are put in trenches 9" deep and increasing height is dealt with by heaping the earth up in ridges with the glass cloches on top. The plant can be trained horizontally along a wire or stopped at the 4th truss. Suitable tomato varieties for cloche culture are Market King, Essex Wonder, Ailsa Craig, Stonor's M.P. The most suitable glass sizes are those which stand 2 ft. wide x 1 ft. high. Taller crops require 20 in. wide x 20 in. high.

451. CHASE PROTECTED CULTIVATION LTD. 631.544.1
Commercial cultivation of crops under cloches.
Publ. Chase Protected Cultivation Ltd., Chertsey, 1941 (?), pp. 8.

Much useful information is given on the cultivation of vegetable crops under the so-called continuous cloche.

452. MILLIRON, H. E. 632.77 : 632.96
A study of some factors affecting the efficiency of *Encarsia formosa* Gahan, an aphelinid parasite of the greenhouse white fly, *Trialeurodes vaporariorum* (Westw.).

Tech. Bull. Mich. agric. Exp. Stat. **173**, 1940, pp. 23, bibl. 47.

The most important factors affecting the activity of the white fly parasite *Encarsia formosa* are temperature followed by humidity and light. The greatest amount of parasitism in the experiments described here was obtained at 75-79° F. with a relative humidity of 50-70%.

453. DESHUSSES, L. A. 621.544.3
Essai de chauffage biologique des couches sans fumier de cheval. (Experiments in the formation of hot beds without stable manure.)
Rev. hort. suisse, 1940, **13** : 243-6, 262-8.

Experiments with various organic materials as a substitute for stable manure in the formation of hotbeds were carried out at the School of Horticulture in French Switzerland [? Chatelaine, Geneva]. The advantages and disadvantages were as follows. *Stable manure* attained a heat of 70° C. in 3 days, fell slowly and maintained a temperature of 20° C. in the soil compost covering for an adequate length of time. *Marc* or the residue from distilled grapes + cyanamide heated up in 5 days and maintained a constant soil temperature of 20° for more than 40 days. It is an easy material to manipulate. Radishes gave a higher yield and lettuces hearted better than on stable manure. Other crops were not inferior. A complete fertilizer should be incorporated in the growing medium when marc is used. *Cacao shell* (seed coat) + cyanamide. This proved remarkably thermogenic and burnt the first batch of seedlings, but after cooling the heat still maintained (27°) enabled the resown crops to catch up with those on beds of other materials under trial. *Leaves* mixed with cyanamide, with sulphate of ammonia and lime, or with stable manure did not produce more than a warm bed in spring and autumn and failed to heat at all in winter. *Clover and corn straws*, however treated, were unsatisfactory for reasons which are discussed. Instructions for making the beds are given, the most important of which are that the soil covering should not be put on until the bed has reached 40-50° C., otherwise fermentation may be checked, and that it is usually necessary to assist it by the addition of moisture and cyanamide. The author concludes that cacao bean shell is likely to prove the most satisfactory of the materials tried, with grape residue second. Photographs show that the vegetables grown on these two materials were vigorous and healthy.

454. NATIONAL INSTITUTE OF AGRICULTURAL BOTANY. 633.491
Varieties of potatoes.
Fmrs' Leaflet. War-time Edit. nat. Inst. agric. Bot. **3**, 1941, pp. 6.

List of varieties suitable for Great Britain in wartime, with cultural hints.

455. JÄRVESOO, E. 633.491
Kartulikasvatustööde tehnikast ja riistadest Saksas. (German potato growing technique and nature of plant.)
Agronomiamäe, 1940, No. 5, pp. 367-75.

Germany attaches extreme importance to the potato crop and an improved cultivation technique has been evolved. Care is taken to have rows absolutely straight and parallel, and not to plant potatoes too deep. Instead of forked plough and various potato ploughs, which involve certain difficulties, the so-called hole-marker is increasingly used. This consists of a narrow ploughshare and a number of scoops fitted to a wheel. The scoops make the holes, at the right intervals, along the furrow. An accessory of this apparatus is the sowing tub. About 8 or 10 days after planting the soil is lightly ploughed over, after which it is banked on the rows with the aid of a flexible grid harrow. When the plants are hand high, a second harrowing takes place. In harvesting the digger wheel has been abandoned in favour of an improved apparatus (made by the Krull works) which gets rid of soil adhering to the tubers and also of stalks. Other devices of a similar type, but of varying efficiency, are also used. Potatoes are stored in clamps or are ensiled. As regards the former procedure, corrugated cardboard has been used instead of straw by way of experiment. Anything from 10 to 30% of the tubers have been found to have sprouted by the spring. For ensiling, potatoes are steamed in a unit of steaming columns,

tipped into a silo lined preferably with bricks or cement, mashed and covered with sacks, followed by a layer of earth, and protected from the weather with a roof.

456. SALAMAN, R. N. 633.491
The biology of the potato.

Chemistry and Industry, 1940, 59 : 735-7.

After noting the S. American origin of the potato the author discusses in turn :—the variant characters common to the potato such as tuber shape, colour, texture and eyes, chemical and vitamin content, culinary qualities and resistance to disease, notably wart disease, blight and virus. He does not consider that either the Trade or Ministry are doing enough to overcome the ravages of disease.

457. CHICK, H. 633.491
Nutritive value of the potato.

Chemistry and Industry, 1940, 59 : 737-9, bibl. 12.

The headings under which the nutritive value of the potato are discussed are :—digestibility, protein and other nitrogenous constituents, vitamins C and B. The author concludes that potatoes might advantageously take the place of some, at least, of the cereals in any given diet.

458. PEREIRA, H. C. 633.491
Studies in soil cultivation. IX. The effect of inter-row tillage on the yield of potatoes.

J. agric. Sci., 1941, 31 : 212-31, bibl. 2.

The experiments were carried out at Ottershaw Park, Surrey, on well drained sandy loam. Three primary comparisons were made to ascertain whether the main object of the common practice of inter-row tillage of the potato crop was weed suppression or whether the fine tilth produced had any beneficial effect on the crop. 1. The weeds were removed without any appreciable mulch being produced. 2. The weeds were destroyed by frequent cultivations which maintained a fine tilth. 3. Two cultivations were given, the second followed immediately by earthing up. This is the usual local practice. In the early stages the crop was very sensitive to weed competition. In the absence of weeds the crop did not respond under a wide range of moisture-supply conditions, either by increase of yield or in percentage of ware to ridging up or to deep and frequent inter-row cultivation. When the water table lay below 4 ft. from the surface the maintenance of a 3 in. soil mulch during dry weather produced no moisture-conservation effect. It was shown that no capillary rise from the water table occurred beyond 4 ft. and where the water table lay deeper water lost by evaporation could not be replaced from below. The author remarks that the demonstration of the limit of capillary rise in a natural soil under field conditions is rarely possible and that the data on this point are therefore of considerable interest.

459. BALD, J. G. 633.491-2.8
The effect of the latent virus (virus X) on the yield of potatoes.

J. Coun. sci. industr. Res. Aust., 1940, 13 : 252-4, bibl. 3.

The results of a field experiment support the view that virus X is one of the chief causes of the reduction of yield of potatoes in Australia, but that since its effects are spread evenly over the whole crop it passes unnoticed. A search for the occasional virus-free plant that may still exist among the commoner Australian varieties or that may perhaps develop from infected tubers would be worth while.

460. SANFORD, G. B., AND CLAY, S. B. 633.491-2.8
Purple dwarf, an undescribed potato disease in Alberta.

Canad. J. Agric., 1941, 19, Sec. C, pp. 68-74, bibl. 5.

What appears to be a new virus disease (being transmissible by grafting) of potatoes is described from Alberta under the name "purple dwarf". It is transmitted through the tubers and is either obvious as soon as the shoots emerge or remains apparently unrecognizable throughout. Symptoms are a stunting of the plant, the newer leaves develop a purple margin and curl upwards, the phloem of the entire plant is disorganized. A brown dendritic necrosis extends

from proximal to distal ends of the tuber. The roots, the stolons and the base of the stem decay in sequence. The central pith in the tubers and the upper stem generally remain normal.

461. COCHRAN, H. L., AND OLSON, L. C. 633.842-1.8
Uptake of nutrients by the Perfection pimiento plant under field conditions and its relation to fertilizer practices in Georgia.
Bull. Ga. Exp. Stat. 208, 1941, pp. 16, bibl. 8.

The data presented show that an average of 243 lb. of nutrient[†] were found in the above-ground portion of an acre of an improved strain of Perfection pimiento grown on a Cecil sandy loam in Georgia, U.S.A. The soil had received an 8.8.6 fertilizer several days before planting. The amounts of the respective nutrients were 82 lb. nitrogen, 56 lb. potash, 51.5 lb. calcium oxide, 36.5 lb. magnesium oxide and 17 lb. phosphoric acid. Forty per cent. of the total quantity absorbed during the 6 months' growing season was taken up in the third month. The descending order of amount of absorption in any one month of the five nutrients considered was potassium, nitrogen, calcium, magnesium and phosphorus. Recommendations arising from the data are made. A complete manuring of the crop is necessary regardless of the price obtained for the fruit at the canning factory. The amount of nitrogen and potash applied to the soil at planting time could be cut down and a side dressing of these nutrients given later on just previous to the maximum absorption period. Phosphorus cannot be used efficiently as a side dressing. To conserve soil fertility the dead plants should be turned in soon after the first killing frost and a cover crop sown soon afterwards to minimize erosion and leaching.

462. KADOW, K. J., AND ANDERSON, H. W. 633.846-2.4
A study of horseradish diseases and their control.
Bull. Ill. agric. Exp. Stat. 469, 1940, pp. 530-83, bibl. 116.

Illinois is the centre of the horseradish industry in U.S.A. Some notes are given on cultural practice, the most interesting of which is the stripping of the side roots once or twice during the summer, leaving only those at the extreme end to gather nourishment. The object is to produce the large straight main root preferred by the grinders and in view of the increased prices received for such roots appears to be profitable. A number of diseases and their control are described. *Leaf diseases.* White rust, *Albugo candida*. Sprays and dusts of various kinds have failed to control it. Development of resistant varieties offers the best chance. Viable seed, however, is not normally produced, but girdling the root just below the crown has resulted in the production of viable seed and the method is under investigation. Bacterial leaf spot, *Phytophthora campestre armoraciae*, is troublesome only in excessively wet seasons. Cercospora leaf spot, *C. armoraciae*. Ramularia leaf spot, *R. armoraciae*, is often confused with *Cercospora*. A number of minor leaf diseases are also mentioned. Control in all these diseases is difficult. Bordeaux mixture seems inefficient especially with white rust and some copper sprays caused much foliage injury, while sulphur is useless. Three virus diseases of the five recognized in crucifers have been reported in horseradish. The "deterioration" which usually sets in in the 3rd or 4th year is attributed to a virus. *Root rots* in field and storage. Bacterial root rot, *Verticillium* wilt, *Penicillium* rot, *Rhizoctonia* rot, *Thielavia* rot, root knot (due to eelworm) and many others. Many of these have been traced to the custom of stripping which results in wound infection. The authors, often experimenting with 32 chemicals, can find no universally effective remedy and can only suggest the careful examination of planting sets selected for storage for the next season's planting, a dusting of these sets with 325 mesh dusting sulphur and an annual change of pitting or storage site. An unprotected storage pit is better than a protected one. The latter may result in premature shooting with subsequent frost injury which will allow rot organisms to enter.

463. WOODMAN, R. M. 635.12 : 631.8
The nutrition of turnips.
Ann. appl. Biol., 1941, 28 : 1-7, bibl. 1.

The influence of variations in the supply of some inorganic nutrients on the growth of the turnip in sand was investigated. Progressive diminution of available nitrogen led to a progressive diminution in yield. Similar diminution in available phosphorus led at first to a continuous rise in yield and to a less chlorotic plant, then, at a relatively low concentration of phosphorus, to an optimum yield and finally to a rapid decrease in yield. Potassium deficiency gave a

characteristic grey-green scorch, limpness of foliage and leaf drop. Yield was not affected by reduction of potassium till a fairly low level had been reached. The presence of boron, 0.0681 p.p.m. as borax, yielded plants of normal size, health and appearance. The absence of boron resulted in the death of the plants. [From author's summary.]

464. JACOBS, S. E. 635.12 : 632.19 : 546.273.33

Brown heart disease of turnips.

Gdnrs' Chron., Lond., 1941, 109 : 91.

A note of the incidence of brown heart disease of turnips in clay soils. It is more prevalent in dry summers and is often made worse by liming. Control is obtained by a dressing of borax, 20 lb. per acre, mixed with dry soil, superphosphate or basic slag for better distribution.

465. ANON. 635.13 : 577.16 : 613.2

The carrot as food.

Nature, 1941, 147 : 132-3.

The chief value of the carrot as food lies in the fact that unlike the parsnip, swede, turnip, radish, etc., it accumulates in its root large amounts of the fat soluble hydrocarbon, carotene $C_{40}H_{56}$. In vertebrates most of the carotene absorbed from the alimentary tract is converted into vitamin A. Varying degrees of vitamin A starvation are seen in xerophthalmia, night blindness, etc. The full grown carrot contains much more than the delicately flavoured young carrot, an average content being about 200 I.U. per gm. which greatly exceeds that of cabbage, 10 I.U. per gm. It is estimated that 1 oz. of carrot per head per day would supply half the normal needs of the population for vitamin A. Storing in clamps does not appreciably affect carotene content provided the roots remain sound. Canning also has no injurious effect on the carotene. Drying appears to result in very little loss, though exact experiments are here necessary to determine proper methods. It is difficult to overdo the vitamin A content of food since surplus carotene will readily and profitably be stored in the liver.

466. ESAU, K. 635.13 : 581.144.2

Developmental anatomy of the fleshy storage organ of *Daucus carota*.

Hilgardia, 1940, 13 : 175-209, bibl. 38.

A very detailed account of the developmental anatomy of the fleshy part of the carrot, emphasizing other points than those dealt with by Havis in *J. agric. Res.*, 1939, 58 : 557 ; *H.A.*, 9 : 901.

467. BONDI, A., MEYER, H., AND VOLKANI, R. 635.24 : 631.563.5

The feeding-value of ensiled Jerusalem artichoke tubers.

Emp. J. exp. Agric., 1941, 9 : 73-6, bibl. 6.

Jerusalem artichoke tubers give a palatable silage of good digestibility and satisfactory nutrient content, comparable in nutritive value to sugar-beet or orange peel. The material is rich in desirable lactic acid and contains very little butyric acid. The experimental work leading to these findings was carried out at the Agricultural Research Station, Rehovot, Palestine.

468. GERM, H. 635.25

Zur Haltbarkeit und Qualitätsbeurteilung von Speisezwiebeln. (Estimation of keeping qualities in onions.)

*Gartenbauwirtsch., 1940, 14 : 697-704, from abstract *Forschungsdienst*, 1940, Vol. 10, abstr. p. 115.*

The author stresses the importance of the relative size of the heart of the onion as compared with that of the onion itself. As heart he designates that part which never grows out into leaves as distinct from the surrounding layers. Onions with large proportion of heart produce top growth later than those with a smaller heart.

469. LEVINE, M., AND LEIN, J. 635.25 : 577.15.04

The effects of various growth substances on the number and the length of roots of *Allium cepa*.

Amer. J. Bot., 1941, 28 : 163-8, bibl. 28.

The submission of onion bulbs to 10^{-8} per cent indoleacetic acid aqueous solution resulted in acceleration of root growth and root production. Immersion in vitamin B₁ solution resulted in

retardation of root growth, the retardation being most pronounced with a 10^{-7} per cent concentration. Vitamin B₁ accelerated the linear growth of onion roots when they were previously immersed in a 10^{-8} per cent indoleacetic acid solution. The exposure of onions to a 10^{-8} per cent solution of colchicine, following an exposure to a 10^{-8} per cent indoleacetic acid solution resulted in stimulation of new root formation and linear growth of roots. The different varieties of onion reacted differently.

470. JONES, H. A., PORTER, D. R., AND LEACH, L. D. 635.25-2.411.4
Breeding for resistance to onion downy mildew caused by *Peronospora destructor*.

Hilgardia, 1939, 12 : 531-50, bibl. 15.

Three sources of resistance have been found :—(1) "strain 13-53", a male-sterile variety of Indian Red, the seed stalks being immune and the foliage highly resistant. (2) "strain 13-20-3" of Indian Red showing seed stalk immunity but only slight foliage resistance and (3) an F₁ hybrid between Red 21 and two inbred lines of Stockton Yellow Flat, viz. 50-6 and 50-6-1.

471. WOLFF, J. 635.31 : 581.192
 Untersuchungen an Spargel. I. Ascorbinsäure. (**Vitamin C in asparagus.**)
Gartenbauwiss., 1940, 15 : 109-17, from abstract *Forschungsdienst*, 1940,
 Vol. 10, abstr. p. 114.

Analysis* [place not given.—Ed.] shows that green asparagus is probably highest in vitamin C, followed by blue, and lastly by white. In all cases the outside contains more than the inside portion and the tips more than the base. The following figures are given :—green asparagus tip 121, middle 52, lower part 21 mg. vitamin C per 100 g. ; blue 68, 31 and 17 mg. per 100 g. ; and white 60, 24 and 16 mg. per 100 g. In storage asparagus loses vitamin rapidly at first, but later much less quickly.

472. ANON. 635.621/2
The Hubbard squash.
Gdnrs' Chron., Lond., 1941, 109 : 166.

The Hubbard squash, popular in U.S.A. but little known in England, is recommended as a wartime food crop for the reason that it is easy to grow and to store for winter use, requiring no storage treatment whatever beyond the shelter of any dry room. Cultivation requirements are of the simplest. The seed is raised under glass and planted out when danger of frost is over. The only cultivation required is the digging of a patch of ground say 2 ft. square for each plant (the spread is about 15 feet) and an occasional bucket of water in dry weather. Hints are given on cooking. Medically the squash is reputed to rank with carrots, turnips and swedes in yielding 10 calories per ounce.

473. REINHOLD, J., AND HAUSRATH, E. 635.63 : 631.811.9
 Versuche mit Spurenelementdüngung zu Treibgurken. (**Minor element manuring for cucumbers.**)
Gartenbauwiss., 1940, 15 : 147-58, from abstract *Forschungsdienst*, 1940,
 Vol. 10, abstr. p. 114.

In 4 out of 7 trials in different parts of Germany the result of adding chromium and manganese to NPK-manured cucumber soils was a significant increase in crop (12-15%). Time of cropping was not affected. These elements are best given separately as follows :—60 g. K₂Cr₂O₇ and 100 g. KMnO₄ per cubic metre of soil.

474. HACKBARTH, J. 635.64 : 631.523
 Dreijährige Ertragsprüfungen mit Tomaten-Zuchtstämmen aus Kreuzungen mit *Solanum racemigerum*. (**Three years' yield tests from descendants of crosses of tomatoes with *S. racemigerum*.**)
Gartenbauwiss., 1940, 15 : 36-47, from abstract *Forschungsdienst*, 1940,
 Vol. 10, abstr. p. 115.

The original parents were Kondine Red and Bonny Best crossed with *Solanum racemigerum*. Results with the F₆-F₈ generation were very promising.

* But see 444.

475. GUSTAFSON, F. G. 581.163 : 635.64
Parthenocarpic and normal fruits compared as to percentage of setting and size.
Bot. Gaz., 1940, 102 : 280-6, bibl. 11.

The experiments were carried out with John Baer tomatoes grown in heavily manured soil in California and in a less rich soil in Michigan. The agents used in producing artificial setting were phenylacetic acid and indolebutyric acid. The results obtained indicate that for the tomato the percentage of setting with chemical treatment is probably as great as with pollination. The parthenocarpic fruits, however, were definitely smaller than the seeded fruits. Early growth rate may be somewhat greater in ovaries treated with chemicals than in those pollinated, but this early rate decreases after a while, possibly because of a lowering of the auxin content in them.

476. LINDENBEIN, W. 612.014.44
Über die Bedeutung der Tageszeit bei zusätzlichen Kunstlichtgaben im Winter. (The importance of the time of day at which artificial light is applied in winter.)
Gartenbauwiss., 1939, 13 : 587-97, from abstract *Forschungsdienst*, 1940, Vol. 9, abstr. p. 121.

The author found it possible by the use of neon and incandescent light to bring tomatoes into flower 20 days earlier than those untreated, provided the light was given in the early morning. The plants were thus able to stand without damage temperatures of 20° to 30° C. which they had been unable to do in previous experiments. This early flowering is considered as a photo-periodic reaction, the tomato being regarded as a long day plant. Another interesting fact was that early morning light application was found to advance flowering in *Phaseolus vulgaris* and *P. multiflorus*, both short day plants, despite the increased length of daylight so caused. He comes to the general conclusion that only when made in the early morning is light application of great effect and practical value. It must be continued until natural daylight is strong enough to ensure assimilation. Lack of success in artificial light treatment is generally due to faulty time of application.

477. THOMAS, W., AND MACK, W. B. 635.64 : 631.8
Foliar diagnosis study of climatic influences on the nutrition of spring and fall grown greenhouse tomatoes.
Plant Physiol., 1941, 16 : 117-44, bibl. 13.

Tomatoes were grown in the spring and in the autumn in a greenhouse at the Pennsylvania Experiment Station. The fertilizer treatments in each season were in two series of which one received horse manure while both received N, P and K alone or in combination of two or of three elements. Both manured and unmanured plots gave higher yields in spring than in autumn except in two cases where certain plots were attacked by *Fusarium* wilt. The significance of characteristics shown by foliar diagnosis of the fifth leaf from the base is discussed. The higher yields of a given treatment in the spring compared with that of the same plot in the fall are associated with a lower value for the nitrogen quota and also for phosphoric acid in the composite NPK unit, and a higher value for potash.

478. ARNON, D. I., STOUT, P. R., AND SIPOS, F. 635.64 : 631.85
Radioactive phosphorus as an indicator of phosphorus absorption of tomato fruits at various stages of development.
Amer. J. Bot., 1940, 27 : 791-8, bibl. 14.

A general discussion of the method of radioactive indicators with special reference to plant physiology is presented. Phosphorus nutrition of tomato fruits at various stages of development was investigated by adding mixtures of radioactive (P^{32}) and common (P^{31}) isotopes of this element to nutrient solutions and tracing their absorption by the plant. The newly-absorbed phosphorus was detected 40 minutes later in the leaves and tips of plants over 6 ft. high. Ripe tomatoes continued to absorb in their pulp small amounts of phosphorus. In green fruit both seeds and pulp absorbed it in decreasing proportions as the fruit grew. Under restricted phosphorus conditions the fruit drew on the phosphorus in the leaves. With a liberal external supply both leaves and fruit showed a gain in phosphorus. The usefulness is demonstrated of

a new technique, which is described, for producing contact "radiographs" showing the distribution of newly absorbed phosphorus in plant tissues. [From authors' summary.]

479. BACHER, T. 635.64 : 631.83/84
 Orienterende Forsøg med stigende Maengder af Fosforsyre og Koli til Tomater i Vaeksthus. (**Varying the amounts of K and P applications to greenhouse tomatoes.**)
Tidsskr. Planteavl., 1939, **44** : 189-206, from abstract *Forschungsdienst*, 1940, Vol. **9**, abstr. p. 122.

Using a soil naturally rich in K and P the author tested the effect of giving additional amounts of K_2O and P_2O_5 [apparently just before planting.—ED.] to greenhouse tomatoes and observing the results on growth and crop. Very large amounts of K_2O resulted in damaged roots but undiminished and, in fact, increased crops, despite the fact that the actual set of fruit diminished. P_2O_5 showed little influence on growth and crop size but improved quality in fruit.

480. ELTINGE, E. T. 635.64 : 631.811.9 : 546.711
Effect of manganese deficiency upon the histology of *Lycopersicum esculentum*.
Plant Physiol., 1941, **16** : 189-95, bibl. 14.

Results from nutrient solution experiments with tomatoes are recorded. Chloroplasts are found to be the first parts of the plant affected by a deficiency of manganese. They finally disintegrate. Plastids deficient in manganese produce little, if any, ascorbic acid. Manganese-deficient leaves are thinner and have smaller palisade cells than normal leaves. Manganese-deficient stems are smaller in diameter, contain less xylem and often show xylem cells plugged with coagulated material. Some of the food stored in deficient leaves is in the form of fat.

481. ENDRINAL, D. M., AND CELINO, M. S. 635.64 : 632.4
Septoria leaf spot of tomato.
Philipp. Agric., 1940, **29** : 593-610, bibl. 17.

The well-known and widespread *Septoria* leaf spot disease of tomato was only reported for the first time from the Philippines in October 1939. This paper describes the organism responsible (*Septoria lycopersici*) and its bionomics. The spores remained viable on dried infected leaves for 6 but not for 8 months. Control measures suggested are seed disinfection and the destruction of infected leaves and plants.

482. HILL, A. V. 635.64 : 632.8
Host range and distribution of tomato big bud.
J. Aust. Inst. agric. Sci., 1940, **6** : 199-200, bibl. 4.

It seems likely that the diseases known as big bud of tomato in Australia, stolbur and montar in Russia and little leaf in south India are all due to the same or to closely related viruses. Similar symptoms have also been observed by the author on non-solanaceous plants. More than one species of jassid appear to be vectors.

483. EKINCI, A. S. 635.65
 Systematische und morphologische Untersuchung der Bohnenrassen und -sorten der Türkei. (**Beans in Turkey : varietal and morphological investigations.**)
Gartenbauwiss., 1940, **14** : 358-432.

The economic importance of *Phaseolus* in Turkey is stressed, followed by a description of the region and the methods of cultivation, the main pests and the chief types of bean grown. In the special part, the characters of the plants and seeds of 232 samples, representing almost all types of bean grown in Turkey, are described, as a basis for their standardization. R.M.I.

484. GENTER, C. F., AND BROWN, H. M. 635.65 : 537.531
X-ray studies on the field bean.
J. Hered., 1941, **32** : 39-44, bibl. 12.

The experiments were carried out with the pea bean Michelite, a variety of *Phaseolus vulgaris*, at Michigan State College. Lots of dormant and germinated seeds were X-rayed with 4 different

dosages. Many different mutations were observed in the second generation, usually only one mutation to a progeny and 67% were chlorophyll abnormalities. Other characters affected were plant size, branching, leaf size, shape and texture, fertility and earliness of maturity.

485. SKOK, J. 635.65 : 631.84 : 632.19
Effect of the form of the available nitrogen on the calcium deficiency symptoms in the bean plant.

Plant Physiol., 1941, **16** : 145-57, bibl. 10.

In these experiments the bean plant was grown with and without calcium using nitrate nitrogen and urea. With calcium present nitrate nitrogen produced better growth than urea. With calcium absent much better growth was made with urea. With urea the calcium deficiency symptoms were much delayed and ultimately very much less severe. It was evident that under normal conditions, including the presence of calcium, urea is not so good a source of nitrogen as the nitrate form for growth of the bean plant and that in the absence of calcium much better growth is made by the bean plant with urea than with nitrates. More conclusive experiments are needed to elucidate the relationship of calcium to nitrogen metabolism.

486. VON STRUVE, A. W. 635.655
The soybean crop in the United States.
Science, 1941, **93** : 86-7.

A note on the expansion of soybean cultivation in U.S.A. and of the uses of its crop. It is grown chiefly in the cornbelt states, especially Illinois, Indiana, Iowa, Missouri and Ohio. Manchuria is the biggest producer in the world. The first reference to soybean is in the writings of the Emperor Shang Nung of China in 2838 B.C. In China it has for centuries ranked as one of the 5 sacred grains necessary to Chinese civilization.

- 487, PARKER, M. W., AND BORTHWICK, H. A. 635.655 : 581.145.1
Floral initiation in Biloxi soybeans as influenced by photosynthetic activity during the induction period.
Bot. Gaz., 1940, **102** : 256-68, bibl. 6.

1. Initiation of flower primordia in Biloxi soybean was limited by controlling photosynthesis during induction. This was done in one case by controlling the CO₂ supplied to the plants and in another by controlling the duration of high-intensity light. 2. When no CO₂ was supplied during 8-hour photoperiods, no initiation of primordia occurred. Plants that received the CO₂ contained in natural air during 2, 4, 6 and 8 hours of each photoperiod produced flower primordia in proportion to the duration of time the natural air was supplied. 3. Plants that received only 1 hour of high-intensity light during an 8-hour photoperiod formed no flower primordia. Those that received 2 hours or more of high-intensity light during the photoperiod produced increasingly larger numbers of flower primordia as the duration of high-intensity light increased. 4. Increased concentration of CO₂ in natural air resulted in increased floral initiation. [Authors' summary.]

488. JOHNSON, G. C., AND PEARL, R. T. 635.1/7
Organisation of food production campaign in country gardens and allotments.
Publ. hort. Educ. Ass., County Hall, Lewes, 1941, pp. 4.

JOHNSON, G. C. 635.1/7
War-time production of vegetables in allotments and gardens. General directions to production officers.

Publ. Sussex County Council, Lewes, 1941, pp. 4.

NATIONAL INSTITUTE OF AGRICULTURAL BOTANY. 633.63
Strains of sugar beet.

Fmrs' Leaflet. War-time Edit. nat. Inst. agric. Bot. **5**, 1941, pp. 4.

BUSHNELL, J. 635.1/7 : 631.416.2
The phosphorus content of a sandy loam containing sufficient available phosphorus for vegetable crops.

Soil Sci., 1941, **51** : 153-8, bibl. 8.

ROBBINS, W. J. 635.64 : 581.144.2
Growth of excised roots and heterosis in tomato.
Amer. J. Bot., 1941, **28** : 216-25, bibl. 34.

SEVERIN, H. H. P.

635.65 : 632.754 : 632.8

Factors affecting curly-top infectivity of the beet leafhopper, *Eutettix tenellus*. *Hilgardia*, 1939, 12 : 497-530, bibl. 23.

489.

BOSHART, K.

633.88

Stand der Forschung auf dem Gebiete des Heilpflanzenanbaues. (**The position of research as regards medicinal plants.**)

Forschungsdienst, 1940, 10 : 300-13, bibl. 33.

The author gives an interesting account of the many experiments which have been made on the effect of climate, altitude and other environmental factors on the essential oil, glucoside and other important contents of a large number of medicinal plants. These different valuable properties are affected in quite opposite ways in different plants, the environmental conditions of the original habitat of the plant in question often being the deciding factor. He deals similarly with the results of manurial experiments. He notes also the great importance of season and even time of day and the method of extraction on the amount of the valuable ingredient in different plants. He urges a reconsideration of the claims of a number of common plants, e.g. *Lactuca virosa*, *Chelidonium majus*, the properties of which were famed many years ago but have now fallen into disrepute largely owing to lack of knowledge as to their proper extraction and exact effects. Given careful investigation many of them could again profitably be brought into use.

490.

SABALITSCHKA, T.

635.937.34 : 577.16

Zur Verwertung der Hagebutten in der Vitamin-C-Versorgung des deutschen Volkes. (**The utilization of rose hips for the production of vitamin C.**)

Forschungsdienst, 1940, 10 : 297-9, bibl. 14.

Experiments in Germany show that of the many rose species available *Rosa rugosa* Thbg. shows very much the highest content of vitamin C in its fruits. In recent trials the fruits were found to contain 535 mg. vitamin C in 100 g. fresh weight of the entire fruit or 1,660 mg. in 100 g. dry weight of the entire fruit. The fruits cut in two can be air dried at 40° C. without appreciable loss of vitamin, after which the seeds can be easily separated out. The seeds contain only traces of the vitamin, but the pulp contains about 2,500 mg. in 100 g. dry weight or 2.5%. The fruits are large and easily picked. The bushes bear heavily and can stand the German winters. They are said to bear the first year after planting and hence to give a very quick return.

491.

RADELOFF, H.

675.042

Der Badan und sein Anbau in Deutschland. (**Megasea (*Bergenia crassifolia*) and its cultivation in Germany as a source of tannin.**)

Forschungsdienst, 1940, 9 : 443-54, bibl. 20.

Investigations at the Hamburg Institute for Applied Botany with different species of *Bergenia* from Russia show the ease with which this plant can be grown, and its possibilities as a source of tannin. *B. crassifolia* or *B. crassifolia sibirica* and *B. cordifolia* appear to be very much the most promising. Large scale harvesting tests at Hamburg have dealt only with *B. crassifolia* and with the leaves only. Particulars are given of cultivation methods. Its preference is for a rather damp soil in semi-shade. Propagation by rhizome appears to be the quickest way of getting a good return, but has the disadvantage of weakening and retarding the mother plant. Propagation by seed is slower. The plant is fairly frost-resistant and was only temporarily set back by a sudden mid-winter temperature of about 0° F., though it was rather more severely affected by late spring frosts. A number of analyses by other workers have been made on its tannin content and some are recorded here. They were, however, obviously made under non-comparable and varying conditions. In the Hamburg experiments the analysis of *B. crassifolia* leaves gave the following results:—fresh weight of plants from 4 plants 619 g.; water content 73.93%; tannin content of fresh weight (average of 2 methods) 5.25%; tannin content of dry weight 20.9%. The botanical features of 7 *Bergenia* species and their tannin content are compared. Assuming from an 18-year average that coppice oak plantation will yield some 64 lb. of tanning material per acre, Russian and German trials show that megasea will yield 8 times as much.

492. SESSOUS, G., AND SCHELL, H. 633.859
Besonderheiten und Ausdehnungsmöglichkeiten des Mohnanbaues. (Notes
on poppy cultivation and its possible spread.)
Forschungsdienst, 1940, 9 : 405-6.

A plea is made for the more widespread cultivation of poppies for oil, which is said to rival olive oil in its valuable properties. Experiments have shown that the poppy is very tolerant of different soil conditions, though more susceptible to weather conditions. During germination and in the following 3 to 4 weeks the poppy prefers moist and rather cool weather, in the growth period 14 days before and after flowering warm and dry weather, and finally from then till the time of ripening plenty of rain and only moderately warm weather. Harvesting is best done in rather drier weather, but this is merely because otherwise sprouting may occur. Trials have shown, however, that the effect of unfavourable weather in any one stage may be obliterated by particularly favourable weather in other growth stages. The old idea that the poppy needs a great deal of cultivation including thinning out to clumps 25 cm. apart containing about 5 plants has been exploded.

493. LOWIG, E., AND BAUMGARTNER, O. 633.85
Untersuchungen über den Ölgehalt von Rapssamenherkünften. (Investiga-
tions into the oil content of rape seed.)
Forschungsdienst, 1940, 9 : 496-502.

1. Great differences were found in crude oil content of the 30 samples of Lembke (19%) and Janetzki (12.5%) winter rape seeds. 2. Janetzki showed on the average a lower weight per 1,000 seeds than Lembke. 3. No correlation was established between the weight of 1,000 seeds and crude oil content. 4. No definite correlation was established between 1,000 seed weight and amount of seed coat. 5. A comparison of the different seed size groups in one and the same sample showed a fall in amount of seed coat with increased size of seed. 6. Crude oil content and amount of seed coat were entirely uncorrelated in the samples tested. 7. The colour of the stored seed gave no indication of its oil content. Fully developed reddish seed of the same sample had the same crude oil content as the blue black seeds. 8. Wrinkled seed had an appreciably lower crude oil content. 9. The Lembke samples were all blue black in colour, the Janetzki reddish. The crude oil content can be considered the same in both for practical purposes. 10. The tendency to form reddish seeds appears to be varietal.

494. BRIEGER, F. G., AND GURGEL, J. T. A. 633.88.32.491
Experiencias preliminares sobre a mamoneira (*Ricinus communis* L.). (Pre-
liminary experiments with the castor oil plant.) [English summary pp. 1½.]
Rev. Agric., S. Paulo, 1940, 15 : 229-48, bibl. 13.

The paper deals with preliminary selections of castor oil plants by the School of Agriculture, São Paulo University, with a view to establishing improved strains. To avoid weighing the entire yield two main values were established in determining the production per plant. Of the small seeded fruits (100 seeds = 20 g.) 50% was seed, and of the large seeded fruit (100 seeds = 45-85 g.) the percentage in weight of seed to husk was 60%. The oil content was generally 50% per seed. A satisfactory yield is considered to be about 124 kg. per ha. There was no correlation between the size and form of the inflorescences and the yield per plant.

495. CASARRUBIA, A. 633.812 + 633.822
El cultivo y destilación de *Mentha piperita* y de la alhucema o lavanda en
Tunuyán. (Cultivation of *Mentha piperita* and lavender in Tunuyan,
Argentina.)
Rev. B.A.P., 1940, 23 : 275 : 39, 41-2.

A short account is given of the cultivation of *Mentha piperita* and lavender, two small industries which are being established on an estate in the Argentine. Two varieties of *Mentha piperita*, here called French and English, have been grown for the past five years for distillation. The yield of fresh mint is 20,000 kilogrammes per hectare producing 38 kg. of essential oil. Cultivation is very simple. The plant is herbaceous and requires only weeding and frequent irrigation. To propagate it is simply split up in spring. The lavender grown is *Lavandula vera*. This has

to be raised from cuttings which are rooted in the nursery and set out in the field when about 35 cm. or more high. At transplanting these rooted plants are lightly trimmed and the shoots thus removed are in turn made into cuttings for planting out the following year. Spacing in the field is 1 m. \times 90 cm. Irrigation is necessary. The yield is not given. There is a small distillery on the estate, of which the working is described.

496. PUTT, E. D. 633.854.54 : 581.4
Observations on morphological characters and flowering processes in the sunflower (*Helianthus annuus* L.).
Sci. Agric., 1941, **21** : 167-79, bibl. 8.

497. COLLINS, J. C. 633.71
Turkish tobacco. Culture and marketing in Southern Rhodesia.
Rhod. agric. J., 1940, **37** : 630-52, 733-51, bibl. 10.

A very complete account of the production from seed to market of Turkish tobacco under Southern Rhodesia conditions. Correct choice of soil has an important bearing on the colour of the leaf. Dark leaf from red clay loams is now out of fashion ; the market requires a bright leaf, lemon-light mahogany in colour, and this can only be produced on sandy loams of granitic or sandstone origin and the lighter types of "contact" soils, intermediate between light and heavy bodied soils. Stress is also laid on the great importance of harvesting the leaf at the correct degree of ripeness. Mistakes in this will materially affect colour, quality and subsequent price. The collective characteristics which indicate the proper stage of maturity are outlined.

498. WATSON, R., AND PETRIE, A. H. K. 633.71-1.8 : 581.192
Physiological ontogeny in the tobacco plant. 4. The drift in nitrogen content of the parts in relation to phosphorus supply and topping, with an analysis of the determination of ontogenetic changes.

Reprinted from *Aust. J. exp. Biol. med. Sci.*, 1940, **18** : 313-40, bibl. 55.

The work is under four heads. 1. The determination of dry-weight and leaf-area changes. 2. The determination of nitrogen accumulation. 3. The determination of percentage nitrogen content. 4. Comparison of drifts in nitrogen and water contents. The method adopted in the discussion, the authors state, has been to outline on somewhat theoretical grounds the factors that may determine various growth processes and then to consider in a frequently speculative manner how such matters may have operated in the present experiment. The discussion of the data is often purely suggestive but it is hoped that, as further experiments are submitted to this type of analysis, the principles that are here faintly indicated will acquire both clarity and precision.

499. MARKWOOD, L. N. 633.71 : 581.192
Determination of nicotine in fresh tobacco leaf.
J. Ass. offic. agric. Chem., 1940, **23** : 804-10, bibl. 10.

A short method is described for determining the nicotine content of fresh tobacco. It consists essentially in digesting a small area of the leaf with sulphuric acid, treating the resulting solution with litharge for purposes of removing protein and neutralizing, treating with magnesium for removal of lead, and then measuring the nicotine either turbidimetrically as phosphotungstate or colorimetrically with cyanogen bromide and β -naphthylamine. The method is adapted for large scale routine tests especially those used in plant breeding. [From author's summary.]

500. GIER, L. J. 633.71 : 581.144.2
Root systems of Bright Belt tobacco.
Amer. J. Bot., 1940, **27** : 780-7, bibl. 27.

The root systems of 700 yellow Mammoth tobacco plants of all ages on 4 soil types were studied in North Carolina over a period of two years. Root distribution seemed to be limited by soil texture rather than by pH or moisture equivalent. The shoot/root ratio was found to be an unreliable index to the nature and efficiency of a root system. The coefficient of correlation of the dry weights of shoots and roots indicates that 25 plants is about the minimum number to be used with safety for ratio studies.

501. TOW, A. J., AND EARL, J. C. 633.71-1.56
The chemical classification of tobaccos. With special reference to the problems of Australian grown tobacco.
J. Coun. sci. industr. Res. Aust., 1940, **13** : 281-9.
 BEST, R. J. 633.71-2.8
The action of electrolytes on solutions of tobacco mosaic virus nucleoprotein (*Marmor tabaci* var. *vulgare* Holmes).
 Reprinted from *Aust. J. exp. Biol. med. Sci.*, 1940, **18** : 307-12, bibl. 7.

FLOWER GROWING.

502. LAURIE, A., AND WAGNER, A. 635.98 : 632.19
Deficiency symptoms of greenhouse flowering crops.
Bull. Ohio Exp. Stat. **611**, 1940, pp. 23, bibl. 41.

The nutrient deficiency symptoms for 9 elements in a number of flowering plants much used in commerce have been investigated and described. A useful key to the symptoms is provided.

503. VOGEL, F., BIERMANN, C., SCHNEBLE, K., AND DIEZ, E. 635.9 : 631.8
Zur Topfpflanzendüngung mit wasserlöslichen Volldüngemitteln. (Manuring pot plants with water soluble fertilizers.)
Gartenbauwiss., 1940, **14** : 491-560.

Tests of proprietary NPK fertilizers on pot grown *Primula obconica*, *Gloxinia*, *Pelargonium*, *Chrysanthemum indicum*, *Cyclamen* and *Hortensia*. A study is also made of the action of the manuring on the soil. R.M.I.

504. VOGEL, F. 635.9 : 631.8
Über die Wirkung einiger Volldüngemittel zu Einjahrsblumen. (The effects of complete fertilizers on annual ornamental plants.)
Gartenbauwiss., 1940, **14** : 471-90.

Tests of proprietary NPK fertilizers on the development of pot grown *Callistephus chinensis*, *Zinnia elegans*, *Antirrhinum majus* and *Salvia splendens*. R.M.I.

505. LINSBAUER, L. 635.9 : 632.19
Der "Starrkrampf" der Physostegiablüte. ("Convulsion" disease in *Physostegia* flowers.)
Gartenbauwiss., 1940, **14** : 343-57.

The phenomenon is found to be due to the interaction of certain morphological and anatomical characters in the flowering axis. R.M.I.

506. KIRKPATRICK, H. 635.937.34 : 631.535 : 577.15.04
Rose propagation with the use of root-inducing substances.
Prof. Pap. Boyce Thompson Inst., 1940, **1** : 32 : 291-6, reprinted from *Amer. Nurseryman*, 1940, **72** : 10 : 7-9.

Most garden roses with the exception of the *Pernetiana* hybrids responded well to a 2 milligram per gram powder dip treatment with indolebutyric acid or a 1.25 milligram-5 milligram per litre solution treatment for 24 hours. Naphthaleneacetic acid and indoleacetic acid were less effective. Temperatures of not less than 65°-75° in the plant houses were necessary to start the cuttings. After rooting the treated cuttings grew normally.

507. HURST, C. C. 635.937.34
Notes on the origin and evolution of our garden roses.
J. roy. hort. Soc., 1941, **66** : 73-82.

The origin and evolution of garden roses is traced up to the year A.D. 1800, which year is taken as the natural dividing line between ancient and modern garden roses. It is shown that the most important of our ancient garden roses have originated from four wild species, namely, the Red Rose (*Rosa rubra* Blackw. 1757 [Syn. *R. gallica* L. 1759 non 1753]), the Phoenician Rose (*R. phoenicia* Boiss), the Musk Rose (*R. moschata* Miller) and the Dog Rose (*R. canina* L.). The origin and evolution of modern garden roses since 1800 will form the subject of another article.

508. DAWSEY, L. H., AND MARKWOOD, L. N. 632.951
Persistence of nicotine on rose bushes sprayed with nicotine sulphate combinations.
J. econ. Ent., 1940, **33** : 722-3, bibl. 1.

A nicotine sulphate-bentonite-soybean oil combination provided the greatest improvement in a series of tests to find a useful nicotine sulphate spray. The formula and method of preparation are given.

509. PARR, W. J., AND SPEYER, E. R. 632.78 : 635.939.98
Some observations on the life history of the Angleshades moth (*Brotolomia meticulosa* L.).
Ann. appl. Biol., 1941, **28** : 29-33, bibl. 19.

The caterpillar is often a pest of chrysanthemums in greenhouses. *Control measures.* Lead arsenate at the rate of 6 lb. per 100 gal. of water sprayed on the plants at intervals after they are brought into the houses but not within 3 weeks of flowering. If lead arsenate spraying has been delayed till too late the plants may be dusted with cryolite. Derris was not very successful in destroying the caterpillars. It rendered the plants distasteful, but the larvae can abstain from feeding for at least 9 days. Pyrethrum dust was ineffective. The work was carried out at the Research Station, Cheshunt.

510. GREEN, D. E. 635.939.516 : 632.452
Antirrhinum rust. IV. Improvement of rust-resistant varieties.
J. roy. hort. Soc., 1941, **66** : 83-6.

Five completely rust-resistant antirrhinum varieties are available at Wisley as a nucleus from which it is hoped to raise rust-resistant strains with an increased range of colour and improved quality. It is noted that darker and narrower leaves are two characters associated with resistant plants.

CITRUS AND SUB-TROPICALS.

511. BONO, B. B. 634.222 : 581.48
Algunas observaciones sobre el número de semillas de la mandarina Clementina. (The number of seeds in the Clementine mandarin.) [French summary 3 lines.]
Bol. Inst. Invest. agron. Madrid, 1939, **2** : 195-207.

The number of seeds in any one fruit of the Clementine mandarin appears to be a question of fertilization. The fruit of flowering shoots covered so as to prevent pollination was practically seedless. Fruit pollinated by the variety Cadena fina, which is nearly seedless, had only a few seeds. Clementine flowers pollinated from other flowers on the same tree gave fruit which contained a comparatively large number of seeds. The investigation is only in its initial stages.

512. HERRERO (EGAÑA), M., AND ACERETE (LAVILLA), A. 634.31 : 581.192
Análisis de elementos nutritivos en el fruto, la flor y el tallo del naranjo. (Analysis of the nutrient elements in fruit, flower and shoot of the orange.)
[French summary pp. 2.]
Bol. Inst. Invest. agron. Madrid, 1939, **2** : 107-93, bibl. 3.

The proportions of nutrient elements present in the fruit, flower and shoot at various seasons in early, mid-season and late orange varieties in Spain are examined. Sixty-four pages consist of tabulated results and graphs. There are some notes on the soil conditions and manurial practices in the Spanish orange zone and on some manurial experiments.

513. OPPENHEIMER, H. R. 634.31-1.541.11
The stock problem of the Shamouti orange.
Hadar, 1940, **13** : 245-8, bibl. 16.

Some further results are given of a citrus rootstock trial on light soil in progress at the Agricultural Research Station, Rehovot. [The previous report appeared *Ibidem*, 1936, **9** : 35-40; *H.A.*, **6** : 362.] The scion variety is the Shamouti or Jaffa orange. Budded lemon-like stock outgrew orange stock which in turn outgrew pummelo Goliath and grapefruit Duncan. The growth is about 20% smaller than that of stocks left unbudded. Stock markedly influenced growth

habits. Upright sour lemon confers a pronouncedly upright growth on the scion and the straggling sweet lime produces similar broad Shamouti tops; sweet and sour orange induce a bushy habit of growth. Bud union is satisfactory with all stocks except rough lemon, but trees on this stock show no symptoms of decline. There was a strong stock influence on yield. Lemon-like stock, except rough lemon, induces bearing in the 3rd year; with other stocks it sets in later and more reluctantly. Fruit quality on orange stocks of various kinds was good; on rough lemon, citron and sweet lime there was a high percentage of big, coarse, insipid fruit of a non-typical shape. An interesting detailed discussion is given on the results obtained with the various stocks. It is concluded that of the stocks tested citron, pummelo, grapefruit and sour orange offer no practical interest for Shamouti on light soils but that rough lemon, sweet orange varieties and possibly sour lemon are worth further attention.

514. DOBROVITZKAYA, S. A. 634.334-1.535
On the rooting of lemon cuttings. [Russian.]
Soviet Subtropics, 1940, No. 7, pp. 46-7.

The results of greenhouse experiments in the Ukraine during 1938 and 1939 showed that lemon cuttings root best at temperatures not below 20° to 22° C., the length and the number of rootlets developed being highest in a mixture of peat with sand or in pure peat. In the absence of peat, mixtures of three parts of sand to one part of "turfy" or "leafy" soil are recommended. All lemon varieties tested gave the highest percentage of plants rooted in a mixture of peat and sand; the variety Cupenek gave 71.4% rooting in a mixture containing three parts of sand to one part of peat.

515. FEDIN, A. H. 634.334 : 581.11
On the transpiration of lemon leaves. [Russian.]
Soviet Subtropics, 1940, No. 6, pp. 35-6.

Experiments designed to demonstrate the intensity of transpiration of lemon leaves were carried out between June and November in the Batoum Botanical Gardens with twelve lemon plants, from each of which three leaves of the first and three of the second vegetative period were taken for examination. The method used was qualitative; white paper soaked for one minute in a cobalt chloride solution, then dried to a blue colour and finally exposed to calcium chloride was placed on the leaf and the gradual change in the colour of the paper to a pink tinge was observed through a glass slide covering both leaf and paper. It was found that if the colour begins to turn pink after 5 seconds the discolouration of the whole paper square is completed after 25 to 30 seconds; if it begins after 8 to 9 seconds it is completed after 40 to 45 seconds. The experimental plants were divided into various groups, some were covered up for the winter and others surrounded with a narrow trench for draining. The results showed that meteorological factors and changes in soil moisture had comparatively less effect on the transpiration than technical factors such as covering up and drainage. On the other hand, the stage of development of the plant was of great importance, the transpiration of vegetative branches being almost twice as intensive as that of the non-vegetative, and leaves of branches about to develop buds intensifying their transpiration to almost double a few days before the buds are due, regardless of external conditions. Leaves examined in November took from 6 to 7 times as long to turn the paper completely pink as those examined in June-August, when the change was accomplished in about 50 seconds. It is concluded that transpiration gives a clear reaction to change of condition, both natural and induced, and that the method involving the use of cobalt chloride paper can be successfully applied in young lemon plantations to determine the water need of the plant as a means of combating drought. During dry periods transpiration was much slower than under normally wet conditions. Plants covered up during the winter against frost had a slower rate of transpiration than those left uncovered.

516. LEVITT, E. C. 634.3-1.4
Do not neglect citrus trees when crop is light.
Agric. Gaz. N.S.W., 1940, 51 : 693-4.

Resoiling, the only measure discussed here, is considered essential to maintain vigour in citrus plantations in the shallow-soil districts of New South Wales and in districts with deeper soils is beneficial when the rootstock is rough lemon, which develops surface rooting. It can often

be a cheap substitution for fertilizers. The benefit to be obtained depends on the humus content of the new soil and virgin surface soil is accordingly preferable. The soil should, of course, be spread over the root area and not heaped round the collar of the tree. Mounds so formed dry out rapidly and if the union is covered collar rot may ensue. In land affected by *Armillaria* rot the life of the trees will be prolonged if the earth is kept withdrawn from the roots at their point of union with the trunk. Such exposure has no ill-effect on growth.

517. TCHKHAIDZE, I. 634.3-1.542.24

An experiment in ringing citrus trees. [Russian.]

Soviet Subtropics, 1940, No. 7, pp. 44-5.

In field experiments during 1938 tangerine trees 2-, 3- and 5-years-old and lemon trees 5-years-old, which had failed to blossom in spring, received circular cuts around the stems or branches with or without the removal of a narrow strip of bark. In the following spring all the "ringed" trees produced abundant blossom (lemon less than tangerines) while the untreated control trees did not blossom at all. Although this treatment is not recommended for very young trees, 2- or 3-years-old, it is thought that "ringing" may be of importance in bringing about an earlier fruiting of citrus trees.

518. SOUTH AFRICA. 634.3 : 382.6

Fruit production in the Union. The 1939 citrus export season.

Bull. Dep. Agric. S. Afr. 216 (*Horticultural Series* 4), 1940, pp. 55, being *Rep.* No. 26.

The report consists of a list of localities in S. Africa from which citrus is exported and statistical data of these exports.

519. BROOKS, F. A., AND KEPNER, R. A. 634.3-2.111

Orchard heater improvements.

Calif. Citrogr., 1941, 26 : 100-1, 102.

A summary of recent improvements effected in orchard heaters as a result of work carried out at Riverside and Davis by the University of California.

520. JACOB, A., GOTTWICK, R., AND SCHULTE, E. 634.3-2.19 : 631.83

Eine durch Chloride hervorgerufene Blattschädigung bei Citrus. (Leaf injury in citrus due to chloride.)

Angew. Bot., 1940, 22 : 301-8.

The manuring of oranges with muriate of potash, especially when a large quantity is given, causes damage to the leaves and young shoots. Although the actual mechanism of the damage is unexplained, it is suggested that the great differences in ratio of the different anions and the cations "K" and "Ca" are responsible.

R.M.I.

521. WAGER, V. A. 634.3-2.8

Leaf markings for diagnosing psorosis or scaly-bark in citrus.

Citr. Gr., 1941, No. 85, pp. 1, 3.

The earlier diagnosis of psorosis by means of leaf markings is becoming of increasing importance. The markings can be seen only on the young leaves from $\frac{1}{2}$ to $1\frac{1}{2}$ inches in length. Though they can sometimes be seen on leaves still attached to the tree it is better to pick the leaf, hold it up to the light and look through it. The markings, if present, will show as small, thin, light-coloured elongated blotches in between the veins. They should not be confused with the white blotches made by thrips or aphids or the irregular markings that develop as a result of some soil deficiency. Unless the tree is in fresh flush the marks may not be visible at all, also on some trees they may be numerous and on others on only a few leaves either dispersed over the tree or in a bunch on an isolated twig. The value of this early diagnosis lies in the fact that, whereas the bark symptoms may not appear for many years, all bud-wood from an infected tree will transmit the disease. Californian methods of voluntary state inspection and registration are recommended for South Africa. This official registration, which is based on the examination of not more than 50 trees per nurseryman, has proved very effective in preventing the spread of the disease in California.

522. HALMA, F. F. 634.3-1.541.5-2.19

Bud-shoot wilt of citrus nursery trees.

Calif. Citogr., 1941, 26 : 86, 106-7.

Attention is directed to a physiological abnormality in citrus nurseries in California characterized by sudden wilt and subsequent death of the initial sprout of autumn-budded trees. The trouble was traced to incomplete union of the conducting tissues of bud and rootstock, which prevents sufficient water from passing to the shoot to sustain it during sudden hot and dry weather. Some interesting data on budding methods were obtained during the investigation in which some 2,300 sweet orange seedling stocks were involved. It was observed that of the two budders employed A cut the buds longer and heavier and made longer vertical slits in the bark than B. This left some space between the upper end of the bud shield and the cross incision on the stock. Quicker healing-in of the buds inserted by B was usual and by spring some of these buds were almost covered by the callus tissues of the stock. A used an average of 5.3 buds per stick while B used 6.6 buds, since A avoided using the so-called flat buds at the lower end of the stick. A had 9.2% of dead buds while B had 4.5%. By 27 May A had 13.2 wilted buds and B 22.1. 85% of the wilt occurred on shoots 15 cm. or less in length and most of them produced a second shoot which did not wilt. B buds often made a late start in growth. At the end of the year there was practically no difference between the trees budded by A and B, being 89.4% of the stand for A and 90.9% for B, the average cross-sectional trunk areas 30 cm. above the union being 1.15 and 1.03 sq. cm. respectively. Differences due to tying methods on buds inserted by B and tied by a third man were marked. As between wax cloth, string (solid) and string (spaced), practically no wilt occurred on any buds tied with string, but the percentage of deaths was 31.1 where the loops were spaced and 16.1 for those tied solidly, and only 5.8 for waxcloth. On 27 May the average length of the shoots was waxcloth 25 cm., string (solid) 58 cm. and string (spaced) 60 cm.

523. VAN DER PLANK, J. E., AND VAN NIEKERT, O. T. 634.3-2.48

Bleaching of sooty blotch from oranges.

Fmg S. Afr., 1941, 16 : 27-8, bibl. 5.

Successful trials have been made with calcium hypochlorite for removing sooty blotch from oranges. This material avoids the use of the more expensive sodium bicarbonate which has to be added to common bleaching powder (chloride of lime), the bleach chiefly used in South Africa, and is more easily prepared. Another way of saving sodium bicarbonate is by mixing the bleaching powder in water and discarding all undissolved residue before adding sodium bicarbonate. The ordinary phenolphthalein indicator for determining acidity in juices may be used to show whether sufficient sodium bicarbonate has been used. Better disinfection of mould is obtained with bleaches made with boric acid instead of sodium bicarbonate. If sodium bicarbonate is used greater disinfection is obtained by using higher strengths of chlorine, adding soda ash to make the stronger solutions stable.

524. VAN DER PLANK, J. E., AND VAN WYK, G. F. 634.3-2.48

Removal of sooty blotch from citrus fruits.

Fmg S. Afr., 1940, 15 : 201-2, bibl. 2.

A method is described of removing sooty blotch from oranges by immersion in solutions containing 1½ oz. sodium bicarbonate to 2 oz. tropical chloride of lime per gal. Strong solutions are unstable and bleaching plants adapted to the use of weak solutions are most economical in material. Strong mixtures for supplementing solutions which have weakened through use may be made with the addition of soda ash, but ordinarily this substance is not desirable. Suggestions are made with regard to the design and operation of bleaching plants. The question of rinsing is discussed. If rinsing is required it should be done in a tank specially designed for the purpose.

525. VAN DER PLANK, J. E. 634.31-2.48

Notes on the bleaching of sooty blotch from oranges.

Citrus Gr., 1940, No. 83, pp. 1, 3, bibl. 5.

These notes supplement the information in abstract 524. The use of a brand of commercial calcium hypochlorite sold under the name H.T.H. and probably other brands is suggested as a

substitute for the bleaching powder universally used in South Africa. The advantages of this change are described. If bleaching powder is used economy in sodium bicarbonate may be effected by removing some of the calcium hydroxide. This is done by well mixing the bleaching powder with water at the rate of 4 oz. per gal. After settling, the white undissolved residue, which is mostly calcium hydroxide, is discarded and the clear solution mixed with sodium bicarbonate. The advantages are :—Only 4 to 6 oz. of sodium bicarbonate are needed instead of 10-12 oz. per lb. of bleaching powder. The precipitate, on adding the sodium bicarbonate, is less bulky and the tanks are more easily cleaned. The solutions of bleaching powder before the addition of sodium bicarbonate are stable and can be made in advance. A similar decantation when boric acid is used instead of sodium bicarbonate is even more economical. Methods for testing whether sufficient sodium bicarbonate is present can be made with the same phenolphthalein indicator used for determining acid in orange juice. Chlorine bleaches are useful disinfectants against mould spores. They are most effective when not rinsed off the fruit and when they contain boric acid or borates. If sodium bicarbonate is used, greater disinfection may be obtained by using higher strengths of chlorine and adding soda ash to make the solution stronger.

526. FREZZI, M. J. 634.31-2.4
 Podredumbre del pie del naranjo. (**Gummosis of the orange tree.**)
Rev. B.A.P., 1940, **23** : 272 : 15-9.

The treatment of gummosis by cutting away the affected parts and by applying bordeaux mixture and vegetable tar to the wounds (the latter to increase the rate of healing) is described. In districts where the disease is frequent any new plantations should be set out with each young tree planted on a small hillock about 20 cm. above normal soil level. The hillock will gradually wear down, leaving the tree with the collar and the upper part of the main roots well above ground. The tree does not suffer in the least and photographs are given which show this. Some care must be taken not to damage the roots when cultivating:

527. HELY, P. C. 634.3-2.752
The citrus red scale problem in New South Wales with special reference to fumigation.
J. Aust. Inst. agric. Sci., 1940, **6** : 140-6, bibl. 20.

The author, after a large series of comparative experiments in different districts, concludes that the standard rate for all fumigants should be in the vicinity of 6 g. HCN per 100 cu. ft. for trees 28 ft.-40 ft. high with suitable increase or decrease according to relative size. Fumigation as regards scale kill and tree injury is affected by the following factors. *Light*. Injury can be caused by daylight work under warm moist conditions. Night work avoids this and gives a better scale kill owing to reduced air movement. *Temperature*. There is no evidence to support the view that scale kills are reduced by low temperatures and that the dosage should be increased for temperatures between 50° and 70° F. Humidity appears to be important with cyanogas but less so with other fumigants. Lemons are particularly sensitive to cyanogas at high humidities, oranges less so. Rain or dew cause the sheets to pick up grit or sand which may have an abrasive action on the fruit. *Atmospheric movement*. Winds over 2.5 m.p.h. may cause tent flap, in which case work should not proceed. *Tent quality*. No decided difference could be seen between heavy 12 oz. duck and various grades down to 5 oz. calico. *Type of gas concentration*. Protective stupefaction, i.e. the supposition that red scale insects previously stupified by low non-lethal doses developed a capacity of resistance to high concentrations of HCN was found by the author to be of little importance. Equally good results are obtainable at equivalent dosages under suitable conditions irrespective of the type of concentration beneath the tent. Some findings following a survey of commercial fumigation on the Murrumbidgee Irrigation Area were :—No clear correlation could be established between percentage scale mortality and individual factors such as temperature, humidity, wind, time of treatment or size and shape of tree. (2) Equally good results were shown where fumigation was carried out under conditions of high temperature and low humidity or vice versa. (3) Scale on mature Valencia's was not more difficult to kill than on green fruit, though such mature fruit did make effective control more difficult. (4) Scale in the grey adult and second moult stages was more resistant to fumigation than in other stages. (5) No satisfactory explanation was found for the lower mortality

obtained on certain trees or groups of trees; such variations were also found in the natural mortality due to heat wave conditions. Resistance appeared to increase on the more vigorous trees. Recent trends in scale control measures and future development are discussed briefly.

528. PERSING, C. O., AND BOYCE, A. M. 634.3-2.73
Citrus thrips control. Present recommendations for the use of tartar emetic.
Calif. Citrogr., 1941, 26 : 118, 144-5.

1. *The efficiency of various types of spray applicators.* As a result of experiments with spraying and dusting appliances at Riverside Experiment Station the spray-duster was preferred. 2. *Effect of certain meteorological conditions.* Rain within a few days of the application of tartar emetic will necessitate respraying. Normally application should not be made when the foliage is wet from dew or with an air temperature of over 100° F. Low humidity conditions do not adversely affect tartar emetic performance. 3. *Volume of spray per acre and concentration of tartar emetic and sugar.* Amounts necessary vary according to apparatus used and species treated. Particulars are given. 4. *Compatibility of tartar emetic with other materials.* Citrus thrips control is reduced by the incorporation of zinc and manganese in the tartar emetic spray. Tartar emetic cannot be combined with an oil spray against scale. Dn-Dust is not compatible with tartar emetic, sulphur dust is probably compatible and the phytocidal and insecticidal properties of hydrocyanic gas are unaffected. 5. *Effect on bees, etc.* No injurious effects have been observed on bees or on beneficial parasites. 6. *Treatment schedules.* Times of treatment depend much on local climatic conditions. Suggestions are made to suit Riverside conditions.

529. HAYWARD, K. J. 632.654.2 : 634.3
 El "herrumbre" o "tostado" de las frutas citricas. (The rust mite of citrus.)
Rev. Industr. Agric. Tucumán, 1940, 30 : 130-5, bibl. 2, being *Circ. Estac. exp. agric. Tucumán* 89.

The citrus rust mite (*Phyllocoptruta* (*Phyllocoptes*) *oleivorus* Ashmead) was first reported for Tucumán Province, Argentine, in 1923. This paper describes the life history of the pest and methods of control. Sulphur treatments of various kinds are effective.

530. COMPERE, H. 634.3-2.752-2.96
Parasites of the black scale (*Saissetia oleae*) in Africa.
Hilgardia, 1940, 13 : 387-425, bibl. 33.

531. MENDES, J. E. T. 633.85
***Aleurites montana*.** [Portuguese.]
Rev. Agric., S. Paulo, 1940, 15 : 176-81, bibl. 5.

Aleurites fordii does not do well in Brazil. The Instituto Agronomico at Campinas was advised to try *A. montana*. *A. fordii* had always been budded on its own stock. Trees of *A. montana* were very scarce and the only way of propagating them in quantity seemed to be to bud them on *A. fordii* stocks. The results were very successful, the take was high and the subsequent growth normal. They have not yet reached fruiting stage. The reverse combination, of which a few were made, also grew well enough to encourage the hope that in *A. montana* might be found a harder stock for *A. fordii*. *A. moluccana* as a stock was unsuccessful both with *A. montana* and *A. fordii*. The buds would sometimes shoot but afterwards died off.

532. WEBSTER, C. C. 633.85
A note on the yield of tung trees in Nyasaland.
E. Afr. agric. J., 1941, 6 : 160-3, bibl. 3.

From recent recordings of the relatively few trees of *Aleurites fordii* and *A. montana* of bearing age in Nyasaland it is concluded that *A. montana* gives every sign of proving profitable while the appearance and results obtained with *A. fordii* make it doubtful whether it will pay its way. Since the difference in price between the two oils is unlikely to be more than £4 a ton, the higher price obtained for *A. fordii* is likely to be offset by the higher yield of *A. montana*. The *montana* plantations grown from seed have from 38 to 40% of predominantly male trees which are more or less useless as croppers, and no change of sex has been observed in 9 years. The yield variation

between individual trees is less pronounced in the case of *A. fordii*. The solution to the preponderance of male trees seems to lie in propagation by budding, which is easy, though records of subsequent behaviour of budded trees are scanty.

533. MOMOT, K. G. 633.88

The cocaine bush. [Russian.]

Soviet Subtropics, 1940, No. 7, pp. 54-7.

The cocaine bush, *Erythroxylum coca*, will not overwinter under Russian conditions and is cultivated in the open only during summer, and in the greenhouse during winter. The leaves are harvested two to three times during summer. In Sukhum, Caucasus, the first attempts to cultivate the bush were made in 1931. Shaded grew better than unshaded plants, which also failed to fruit. The plants must be removed to the greenhouse in autumn before the temperature drops to below 10° C., and in May they can be planted out again at the rate of 100,000 to 110,000 plants per ha. The tips of branches of one-year-old plants with three to four leaves are used for propagation, the cuttings being put into sand heated to a temperature of 25° to 28°, when they will root in 35 to 50 days. 4 kg. of cocaine can be harvested from 1 hectare planted.

534. ANON. 588.427

Passion fruit growing should not be neglected.

Fruit Cult., N.S.W., 1940, 10 : 124 : 3, 22.

The decline in production of passion fruit is attributed to the bullet or woodiness disease and to brown spot. With regard to woodiness promising investigations are still in progress. Brown spot (*Alternaria passiflorae*) is described and illustrated. The chief characteristics are the appearance of brown spots on all above ground parts of the plant and the conspicuous wilting of the shoots. The spread of the fungus is assisted by lack of pruning and excessive growth. Systematic training and an annual pruning of laterals are preventive measures. Bordeaux mixture is applied to the young vines in early summer and to the older ones after pruning; spraying should be at monthly intervals in spring and summer and thereafter at two-monthly intervals till pruning time. Spray deposit may be removed by dipping in ¼-1% solution of citric, tartaric, or hydrochloric acid. Diseased fruit and foliage should be destroyed and boxes sterilized or the plantation will never be free from infection.

535. ANON. 588.427 : 631.564

Marketing passion fruit.

Qd agric. J., 1940, 54 : 311.

Passion fruit for market should not be allowed to fall from the vines. Fallen fruit quickly becomes crinkled, reducing its size and value to the retailer. The fruit should be picked when showing half colour, which will greatly increase its marketing life and raise the selling value. Crinkled fruit should be packed and sold with marked and blemished fruit. Retailers will probably not accept it but there are other markets available. Fruit should be packed on the diagonal system which gives it the maximum of protection and display value.

536. LANGE, D. F. 634.574-1.541

On the vegetative propagation of pistachio. [Russian.]

Soviet Subtropics, 1940, No. 7, pp. 48-50.

Attempts to graft pistachio trees (*Pistacia vera*) in spring gave negative results, owing, it is believed, to the fact that the grafting material had exhausted its nutritive reserves during the long storage and consequently dried up two weeks after grafting. Furthermore, the presence of abundant gumming prevented callusing. There was little difference between the use of male and female buds. The best results were obtained in the late summer with non-woody grafting material with developing buds. Various types of fertilization applied after grafting gave no advantage over the untreated control. Keeping plants in complete darkness for 10 days led to only 10% of grafting being successful, but kept under permanent shade allowing for only indirect sunlight for 15 days, 100% of the grafts proved successful. It appears that under the conditions of the Apsheiron peninsula the most suitable time of grafting lies between the 1st of August and the 1st of September.

537. DÍAZ Y MUÑOZ, J., AND BURGOS (PEÑA), P. 634.63
 Estudio de algunas variedades de aceitunas de la cosecha de 1934-35. (**A study of some olive varieties at the 1934-35 harvest.**) [French summary 8 lines.]
Bol. Inst. Invest. agron. Madrid, 1939, 2 : 241-52.

In continuation of previous work the fruit of a number of olive varieties from different districts was analysed during the 1934-35 harvest. The results are tabulated.

538. CRUZ (VALERO), A., AND OTHERS. 634.63-1.556.1 : 581.192
 Experiencias para determinar las épocas de recolección de las aceitunas destinadas a la elaboración de aceites. (**Experiments to determine the picking times of olives for oil extraction.**) [French summary 23 lines.]
Bol. Inst. Invest. agron. Madrid, 1939, 2 : 211-37, bibl. 7.

From preliminary investigations the following facts have been established :—The fat and moisture content of olives of a given tree vary greatly during development and exhibit considerable fluctuation even at what is considered to be maturity. Reduction of content from that previously ascertained may be as much as 25%. Oil analyses show differences in composition for the same tree at different times; these differences are even more marked between varieties. Thus isolated analyses are useless to determine composition and quantity of fats.

539. UPHOF, J. T. 634.651
 Das nördlichste Kulturgebiet der Papaya im Staate Florida. (**The most northerly district of Florida for the growing of papaws.**)
Tropenpflanzer, 1939, 42 : 363-70.

Although it is often stated that the papaw originated in Colombia and neighbouring countries, the statement has not been conclusively proved and the plant may well be of hybrid origin. The author has found a variety on the east coast of Florida which closely resembles the cultivated form but has much smaller and less palatable fruit; this may be a truly wild variety or merely the cultivated variety in a wild state. The papaw is grown as an economic crop only in southern Florida, parts of Texas and southern California. It is very susceptible to frost. The following account of its cultivation applies only to Florida. The plant needs a rich soil and, if the soil is naturally light, it must be heavily manured. Abundant water supply is also essential. The plants are almost entirely raised from seed. Budding has been tried with some success. Though the seed can be planted at any time, January is considered the best month. Such plants may begin to fruit as early as November of the same year, when they are only 1 or 1½ metres high. Papaws are planted more closely than any other fruit tree, a space of 10 × 10 ft. or 12 × 12 ft. only being necessary. A tree yields on an average 50-100 lb. yearly. No special variety is grown in Florida but there is plenty of variation in size, etc., of fruit and in taste and smell. It is mainly the dioecious form which is cultivated. The fruit is gathered while still green with here and there traces of yellow or orange. R.M.I.

540. HANCOCK, W. G. 634.651-1.541
Grafting male papaw trees.
Qd agric. J., 1940, 54 : 377-9.

Difficulties to be overcome in topworking male papaw trees are a too copious sap flow, the liability of the cut surface to rots, the tendency of the stock to die back a few inches, and the rapid wilting of the scions when exposed to dry air. On the other hand papaw tissue is naturally very ready to unite. The stocks for grafting are 1½-2½ inches in diameter, by which stage the flowers by which the sex can be determined will have appeared. The scions, side shoots 6-8 inches long, and preferably those with a small hard knob at the base, are taken from a mature tree, which can be selected and cut back in advance to make it produce suitable scion wood. The graft wood is best taken from young trees. Grafts made from older trees appear senile from the start. The scions are prepared by removal of the leaves, except for a short piece of petiole, and by rinsing in strong potassium permanganate. Until required they are kept wrapped in a cloth wrung out in the solution. To prepare the stock a horizontal cut is made three-quarters through the stock 6 inches above the ground, at which point it is solid. Ten inches above this point a deep slice or scoop is taken from the stem and continued down to the first cut. All cuts except the grafting surface are swabbed with permanganate of potash. This stops the sap flow. In

the step so formed a cleft is made as near the standing part as possible. The scion is cut wedge-shaped as in an ordinary cleft graft but, as papaw tissue is very soft, it is best slightly to shape the cleft and wedge to prevent undue pressure when the former is inserted. The tie is made with raffia and the earth is then mounded up so as just to cover the tip of the scion. The portion of the trunk left standing is tied before treatment to a stake to prevent movement. In 14 days the soil can be removed for inspection, by which time the graft will either have taken or failed. If it has taken, the soil is gently replaced. The standing part of the stock is cut off when growth begins about 2 weeks later but the soil is left as a protection from sun heat. Papaw tissue calluses rapidly under moist earth. A handful of moist earth plastered over the cut top of a tree will very quickly cause the cut to heal instead of shredding and rotting back. This graft has proved successful in North Queensland.

541. YIN, H. C. 634.651 : 581.18
Studies on the nyctinastic movement of the leaves of *Carica papaya*.
Amer. J. Bot., 1941, 28 : 250-61, bibl. 42.

As the result of experiments [presumably] at Pasadena, Calif. the author enunciates a tentative theory of the nyctinastic or sleeping movements of the leaves of the papaw. He considers further investigations to be essential.

542. HORNE, W. T. 634.653-2.8
Avocado sun-blotch again.
Calavo News, 1941, 15 : 1 : 3.

Sun-blotch of avocado is now known to be a virus disease, and while at present a great deal of damage is not manifest experience with scaly bark of citrus (psorosis), which slowly but surely kills the tree over a long period of years, has made growers desire to be free of it. Dr. Chandler of the University of California is preparing certain suggestions for a procedure which it is hoped will retard and possibly finally eliminate the disease.

543. WIMBUSH, S. H. 634.973.737
A comparison of wattle growing in Natal and in Kenya. I. Notes on South African practice.
E. Afr. agric. J., 1941, 6 : 121-6.

The basis of South African wattle* cultivation is to maintain vigour from the start since wattles suffering from lost vigour due to any cultural neglect seldom regain it. This is important, for the tannin content increases with the thickness of the bark and this in turn is dependent on diameter and therefore on the general vigour of the tree. In cultivation this vigour is nursed from the start by early selection of the most vigorous from the crop of seedlings and by destroying all other vegetative growth including the unselected seedlings. The ultimate yield depends on the first year of life in the wattle plantation. Cultivation methods are described. Seeding is largely done by sowing and not by natural regeneration, 6-7 feet being the usual distance between rows. The application of superphosphates at the rate of 200 lb. per acre at the beginning of each rotation is usual. Burning the brushwood from the felled trees at the end of a rotation reduces fertility. Plantations are kept scrupulously free of weeds. Reduction in height and vigour becomes most marked even in cases where the weeding has been delayed only a few months. Care is taken when hoeing not to damage the roots. Mechanical hoeing is impossible after the first weeding. Pruning takes place when the trees are 6 feet and 12 feet high and consists only in removing any shoot that may be competing with the leader. Only about one in every three trees requires this attention. The trees are gradually thinned till from an original 800 per acre at 3 feet apart in the rows only 250 trees, which should be 7-10 feet high, remain. This drastic thinning ensures a better price for the bark which more than compensates for the loss in stems per acre. The amount of thinning, however, which may be resumed when the trees are 20 or even 40 ft. high and in the latter case will have saleable bark, is largely dependent on local conditions. Stripping on standing trees is done by pulling down the bark from breast height. A recent practice is to chop round the base of the tree before stripping, since manufacturers have taken to objecting to the dark colour of the bark at the base, although in Kenya it is held that

* Green wattle *Acacia decurrens* Willd., black wattle *Acacia decurrens* Willd. var. *mollis* Lindl.

this bark at the collar is the richest in the tree. Methods of grading and bark examination used in S. Africa are discussed.

TROPICAL CROPS.

544. WARDLAW, C. W. 551.566.1 : 63

Foundations of tropical agriculture.

Nature, 1941, 147 : 282-6.

A brief survey of the life, work and aims of the Imperial College of Tropical Agriculture, Trinidad.

545. DAMMERMAN, K. W. 58.006 : 551.566.1

The botanical gardens at Buitenzorg as a scientific institution—its past and present.

Ann. Jard. bot. Buitenzorg, 1939, 49 : 1-26.

The history of the famous botanic gardens at Buitenzorg and that of the various scientific research establishments which came into existence in connexion with them are related. It is emphasized throughout that the rôle the Botanic Gardens now have to play is that of a centre for pure biological research, that is, long term research without orientation to any particular local agricultural problems. Agricultural research having practical application to local crops should be conducted by the Agricultural Department.

546. WOOD, R. C., AND HARDY, F. 631.8

The college permanent manurial experiment.

Trop. Agriculture, Trin., 1941, 18 : 48-61.

A report on the results obtained by the permanent manurial experiment laid down by the Imperial College of Tropical Agriculture, Trinidad, in 1931 to ascertain the chief nutrient deficiencies and responses to manuring of the College Farm soil. Certain recommendations are made for future work, based on the fact that the unit dressings of artificial manures initially selected have proved to be insufficient in quantity and unbalanced in nutrient ratio for the crops grown and that the unit dressing of organic manure was not chemically equivalent to the unit dressing of mixed artificials. The aim is to devise an artificial manure mixture suitable for high production of short period field crops.

547. BURNS, W. 632.951.2

The growing of pyrethrum in India.

Indian Fmg, 1941, 11 : 58-60.

A brief account is given of the start of commercial pyrethrum growing in India with special reference to the trials in the Punjab. The method of cultivation most suitable to that locality is described. Evidence is produced to show that pyrethrum will grow in certain parts of India but a chemical check of the pyrethrin content will be needed. The best India samples are in this respect at present somewhat below the level of 1.36% total pyrethrin of the Kenya product. The organized expansion of production and marketing and the local production of seed requires attention.

548. SANTOS, P. R. 632.951.1 : 632.4

Leaf spot of derris.

Philipp. Agric., 1941, 29 : 641-59, bibl. 4.

Leaf spot of derris (*Phyllosticta derriidis* P. Henn.) is prevalent in the Philippines, about 40% of the leaves in the open and 70% in moist shady places being attacked. The lesions are russet, varying in size from small dot-like spots to those involving as much as one-half of the entire leaf. Inoculation and other work on the disease is described. Some control may be obtained by collecting and destroying infected material in the field especially in new areas. A standard 4-4-50 bordeaux spray reduces infection considerably, but its practicability was not studied in the field in the absence of a large scale field planting.

549. ADAMSON, A. M. 632.7

The geographical distribution of insect pests.

Trop. Agriculture, Trin., 1941, 18 : 43-7, bibl. 4.

The history of quarantine laws for plants throughout the world is reviewed and their value discussed. Instances are given of early introductions of insect pests and of later introductions

made since such regulations have been almost universally imposed. Instances of success in the complete eradication of some of the more recent introductions are given, notably that of the Mediterranean fruit fly in Florida.

550. COOMBES, A. N.

633.491 : 551.566.1

Potato culture in Mauritius.

Gen. Ser. Bull. Dep. Agric. Mauritius 48, 1940, pp. 39, bibl. 10, 50 cents.

Potatoes in Mauritius cannot be planted later than early October or earlier than the middle of February, the heaviest crops being obtained in winter. They are usually grown from sea level to an altitude of 1,400 ft. Climatic conditions are more important in their effects than soil and the growing season temperatures most suitable are between 60° and 70° F. with the "maximum" yield at the lower temperatures. Seed has to be imported. Summer planting is unsuccessful because the high temperature favours leaf rather than tuber production and, since the heavy rains alternating with hot sunny days cause hardening and cracking of the soil, the roots are injured and the sets rot. The crop occupies the ground for 2½ months if planted in March, or for 3-3½ months if planted between May and October. Time of planting varies with the locality and the method of cultivation, i.e. whether between cane rows or in the open, and with the kind of water supply, irrigation or rain. A table of planting seasons and other information for 8 districts is given. Some farmyard manure is supplied but artificial fertilizers are distrusted for fear of impairing the keeping qualities. This is probably because the fertilizer when used consists mostly of sulphate of ammonia and because the crop is often lifted before maturity. The bulletin closes with a discussion on the economics of potato planting as they affect Mauritius.

551. RAYMOND, W. D., JOJO, W., AND NICODEMUS, Z.

633.682 : 613.2

The nutritive value of some Tanganyika foods. II. Cassava.

East Afr. agric. J., 1941, 6 : 154-9, bibl. 12.

The root of the cassava plant in its fresh state is a source of ascorbic acid comparable with the sweet potato. Its cyanogenetic glycoside content varies according to variety and cultivation, but most Tanganyika varieties do not contain much. The hydrocyanic acid is destroyed on roasting or boiling. The protein and mineral content of the root is low, and it contains a negligible amount of digestible fat. The leaf also contains cyanogenetic glycosides, but these are destroyed by African methods of cooking. It is one of the richest sources of vitamin C, while it also contains appreciable amounts of carotene, losing little of either of these substances on cooking. It is also rich in calcium, but contains oxalic acid. The inclusion of both the fresh root and the leaf makes a most valuable addition to African diets and every encouragement should be given to the use of cassava as a supplement to the main staple. The dried ground root is not valuable as a staple, but no doubt has its place as a famine food. By extracting the juice from cooked leaves and vacuum concentration, preparations that appear to keep well, containing upwards of 2,000 mgm. of ascorbic acid per 100 gm., may be obtained. The cooked leaf may also be preserved by home bottling methods. [Authors' summary.]

552. GREEN, E. C.

633.689

The cultivation of native food crops.

New Guinea agric. Gaz., 1941, 7 : 44-9.

Methods of cultivation of some native food crops of New Guinea are fully described. Only data obtained in experimental work will be mentioned in the abstract. *Native taro*, *Colocasia* spp. Hundreds of varieties exist of which 67 have been tested at the Demonstration Plantation, Keravat. Shallow planting holes result in the tubers being formed and developed above ground, where they are subject to beetle attack, fail to attain normal size or may rot before reaching maturity. The sucker or top is placed in a hole 9 inches deep, covered to a depth of 4 inches and not pressed down. The rest of the hole fills as the plant grows. Yield should be 5 tons of edible tubers per acre. *Kong-kong taro*, *Xanthosoma* spp. Varieties are limited to a green and blue and possibly a red stem. Large deep holes are necessary because the edible portion comprises the suckers which are produced in radial formation around the parent. If cut sections of parent stems are used for planting instead of suckers these must be shallow planted or they will rot. They are subsequently earthed up in the 4th or 5th month. Suckers or parent stems

mature in 9 months, sections in 12. Higher yields are obtained, however, 12-18 months after planting. The method of ratooning or allowing a second crop to be taken off the same land materially reduces yield and impoverishes the soil for succeeding crops. Yield from 10 to 15 tons per acre. *Sweet potato*. The crop is grown on ridges or hills which must be large for proper development of the plant. Maturity is in from 5 to 7 months. Some varieties can remain in the ground till the 8th-9th month after planting but soft varieties must be harvested as soon as mature. Experimental improvements in cultivation, namely, proper spacing, use of correct planting material, control of sweet potato weevil and caterpillar (the latter by the giant toad, *Bufo marinus*), large hills and full maturity at harvest raised yields from 7 to 9 tons per acre to maximum yields of 17½ tons. The tubers will store for 10 days. *Yams*. Three very distinct types are cultivated. These are described. The planting ridges should be at least 2 feet above ground level with 9 inches of tilled soil beneath and spread 4 feet apart. Although the native uses small tubers for planting experiment has shown that small tubers produce much smaller crops than medium sized tubers or the cut off top section of a large tuber. Small tubers also yield excessive proportions of small and very small tubers. Staking the common yam and Taitu yam increased yield by 30%. With the Mammee yam staking was uneconomic. Yield of a well grown crop is about 9 tons per acre.

553. VAN DER POEL, J. 633.71

Verdere gegevens over beïnvloeding van de tabak door de voorafgaande begroeiing der grond. (**Further data on the influence on tobacco of crops preceding it.**) [English summary 1 p.]

Meded. Deli Proefstat. Medan, Sumatra, Ser. 3, No. 9, 1940, pp. 35, bibl. 25.

The effect is described of the influence of the preceding growth of secondary fallow forest or cultivated trees and shrubs on wrapper tobacco in Sumatra, with special reference to slime disease, *Pseudomonas solanacearum*. Ground which had previously grown *Mimosa invisa*, lalang (*Imperata cylindrica*) burnt once or twice a year, and natural fallow mulched with vegetable debris decreased the incidence of slime disease on the tobacco. This *Mimosa* and lalang are immune from slime disease and the regular burning of the lalang destroys any susceptible weeds. The tree *Macaranga tanarius* appears to exert an unfavourable effect on the quality of the succeeding tobacco crop. The tall grasses *Sorghum propinquum* and *Erianthus arundinaceus* also seem to inhibit slime disease.

554. VAN DER WEIJ, H. G. 633.71-2.8

Desinfectie tegen tabaksmozaiek. (**Chemical control of tobacco mosaic.**) [English summary 1 p.]

Meded. Deli Proefstat. Medan. Sumatra, Ser. 3, No. 6, 1940, pp. 22, bibl. 7.

The most effective disinfectant for the hands of labourers and others against tobacco mosaic virus is an 8% trisodiumphosphate-4% coprasodium soap solution. The men should dip their hands in this as often as possible. The soap not only supports the action of the triphosphate but has the useful psychological effect of causing the dipper involuntarily to wash his hands and rinse them in an adjoining tin of clean water. The solution keeps well and may be made up at 4 times the strength as a stock solution. When the solution loses its soapy properties it must be renewed. However, the best preventive is not disinfection of the hands but the immediate removal of every suspected plant.

555. VAN DER WEIJ, H. G. 633.71-2.411

I. Onbetrouwbare bibit en slijmziekte in de aanplant. (**Slime disease in the tobacco plantation as a result of seed bud infection.**) [English summary 1½ pp.]

Meded. Deli Proefstat. Medan, Sumatra, Ser. 3, No. 10, 1940, pp. 3-10, bibl. 1.

II. Kan de slijmziekte zich horizontaal door de grond verspreiden. (**Can slime disease spread horizontally through the soil?**) [English summary 11 lines.]

Ibidem, pp. 11-3.

III. Nieuwe elementen in de braaklandflora van het Delische tabaksgebied en hun beteekenis voor het slijmziekte-vraagstuk. (**The importance of certain new elements in the flora of fallow tobacco land in the Sumatra wrapper district in connection with the slime disease problem.**) [English summary 1½ pp.]

Ibidem, pp. 14-25, bibl. 7.

I. A series of experiments are described which show that if slime disease (*Pseudomonas solanacearum*) appears on newly set out tobacco plantings within 18 days after transplanting to clean or even to slightly slime infected soils the outbreak is due to infection from the seed bed. If, however, the soil is heavily slime-sick the origin of the outbreak is not positively ascertainable.

II. From data supplied it appears that there is no plant to plant or horizontal dissemination through the soil of slime disease.

III. Sumatra wrapper tobacco land lies fallow for 7 years and is cleared and planted in the 8th. The susceptibility of the weed flora to slime disease in the fallow period is therefore important. *Gynura crepitans* is susceptible to strains both virulent and non-virulent to tobacco. The shrub *Clibadium surinamensis* is immune. *Eupatorium odoratum* is susceptible through inoculation but only once has been found naturally infected. *Pueraria javanica* and *Centrosema pubescens*, common cover crops, are immune but *C. pubescens*, although it is immune even to inoculations, in some way renders the soil more suitable for the disease. *Salvia privoides*, a new cover plant in coffee, is spreading as a weed and is very susceptible.

556. VAN DER LAAN, P. A. 633.71-2.78
Onderzoekingen over levenswijze der tabaksrupsen. (**Biology of tobacco caterpillars.**) [English summary 2 pp.]

Meded. Deli Proefstat. Medan, Sumatra, Ser. 3, No. 8, 1940, pp. 47, bibl. 36.

The three worst pests of tobacco in Sumatra are the caterpillars of *Heliothis assulta*, *Plusia signata* and *Prodenia litura*, and these and their life histories were the principal ones investigated.

557. VAN EMDEN, J. H. 633.72
Het toetsen der theecloonen. (**Tea clone trials.**)
Bergcultures, 1941, 15: 118-24, bibl. 1.

The paper is divided into three sections. (I) Explains the necessity for carrying out official trials of tea clones already selected by commercial plantations. The main reason is that clonal performance is quite often inferior to that of the parent tree and it is not easy without complete change of environment to say whether this difference is inherent or a result of environment. (II) Discusses methods of conducting the trials:—(a) planting budded plants of the selected clones at random and recording the individual yields, (b) planting in blocks of 8 rows, of 8 plants each with one clone to a row, replicated 4 times, (c) planting whole plots with one clone. (a) is never now used; (b) is useful for small numbers and provides homogeneous soil, homogeneous plant material and uniform treatment; the chief objection is the influence of the adjoining rows; (c) is probably the best, though no plots in full yield yet exist because of insufficient trial material. (III) Gives tables of trial results obtained to date with various clones variously planted with reservations as to the deductions to be drawn from them.

558. WOODFORD, E. K., AND COOPER, H. R. 633.72-1.8
A factorial experiment on the manuring of young tea.
Emp. J. exp. Agr., 1941, 9: 12-22, bibl. 7.

Results are described of a multiple-factor experiment on young tea carried out over 4 years to investigate the response of two types of tea plant to nitrogenous phosphatic and potassic manures. The treatment effects were in the same direction for both jats though the light-leaved type was the more responsive. Not until the third year of successive application did nitrogen prove beneficial, when it increased the weight of leaf. The only significant effect of phosphoric acid (20 lb. per acre) was to increase the weight of prunings in the third year. Interaction between phosphorus and nitrogen was significant only in the third year and indicated that phosphatic fertilizer was effective only in the presence of the higher nitrogen dressing (60 lb. per acre) and that the benefit was the same with 20 lb. or 60 lb. of phosphoric acid per acre. Potash increased weight of leaf and prunings throughout the experiment and the increased

growth was almost directly proportional to the amount of potassium applied. Red spider (*Tetranychus bioculatus*) incidence in two years of severe attack was in both years significantly higher on dark-leaved jat and on bushes receiving the heavier doses of nitrogen in one year. Potash decreased the amount of red spider in the second year but only on the light-leaved jat. Phosphorus reduced the attack in both years.

559. SREERANGACHAR, H. B. 633.72 : 577.16

Ascorbic acid (vitamin C) in tea.

J. Soc. chem. Industr., 1940, **59** : 272-4, bibl. 18.

The author using the Tillmans and Harris method involving the use of 2 : 6-dichlorophenol-indophenol finds that the ascorbic acid content of tea varies with the sample. Buds contained none, while leaves contained more than the stalk, and the second leaf more than the first. It is entirely destroyed during manufacture in the drying stage.

560. NUTMAN, F. J. 633.73 : 581.11

Studies of the physiology of *Coffea arabica*. III. Transpiration rates of whole trees in relation to natural environmental conditions.

Ann. Bot., Lond., 1941, **5** : 59-81, bibl. 11.

A method is described and the apparatus illustrated whereby the transpiration rates of large plants can be determined over short time intervals. The fluctuations of the daily march of transpiration of *Coffea arabica* recorded over 5-minute intervals in 3 different environments and the hourly average transpiration rate are mainly determined by radiation especially when this is moderate or low, though in the case of the hourly average transpiration rate other factors play a subsidiary part. The daily transpiration rate is shown to be determined both by radiation and by saturation deficit and to be independent of temperature. These results are discussed in relation to those of Briggs and Schantz* and it is suggested that the deductions made by these authors from their records are in question. The transpiration rate of coffee is shown to be very greatly reduced during periods of slight water strain and this is ascribed to the high water tension in the plant at such times. The work was carried out at Arusha in Tanganyika Territory at an altitude of 4,300 ft. The trees were grown at Amani in metal containers holding 450 lb. of soil, were 5 ft. in height and had an average of 1,100 leaves. They were unaffected by transportation of 300 miles to the site of the experiments.

561. COOLHAAS, C. 633.73-1.541.44

Wat kan men met tuinverenting in de koffie bereiken? (**Topworking coffee.**)

Bergcultures, 1941, **15** : 62-71.

The paper discusses value of working over low-yielding coffee trees in the plantation. A system is explained, apparently hypothetical but based on data from an existing plantation, whereby the low yielders are gradually traced and reworked over a period of about 6 years, a low yielder being one that has failed to reach a certain standard of yield for two or three successive years. The standard required is computed annually in relation to the current year's total yield of the plantation. It is calculated that after grafting a plantation tree will show a reduced yield for three years on its previous production and will then give an increase. Failure to get worth while results from plantation grafting is often due to postponing the work till the trees are in a physically poor condition from any cause. In a non-clonal plantation the low yielders should be traced and dealt with at once. In the hypothetical case on the plantation in question the number would have been 47% of the whole.

562. KLEIN, V. 633.73-2.4

La enfermedad del café en el oriente. (A root disease of coffee in the east of Guatemala.)

Rev. agric., Guatemala, 1940, **17** : 319.

A note of a root disease which occasionally attacks coffee in the neighbourhood of Lake Pino, Guatemala, with varying degrees of severity. The trees attacked turn yellow and often die. The causal organism is a fungus belonging to the myxomycetes which enters through the root hairs, and by injuring the cells causes the plant to secrete internally a substance which obstructs

* *J. agric. Res.*, 1916, **7** : 155.

the passage of water and nutrients. The fungus fructifies in the soil and is easily spread by various agencies. Control measures consist in disinfecting the soil for two metres round each bush site with a 5% sulphate of copper solution; the affected bush should be dug up with the roots and burnt. An immune race might be established by propagating exclusively from trees which have had the disease and recovered.

563. LANDBOUWKUNDIG INSTITUUT.

633.74

Cacao.

Landbouw, 1940, 16 : 763-4.

Some practical notes are given on methods of raising cacao seedlings in Java where cacao grows well up to 500 metres above sea level and on a variety of soils. There is an average rainfall of 2,500-3,500 mm. The principal points brought out are as follows:—The seed quickly loses viability if not sown at once. It is cleaned by rubbing in a rough cloth with sand or sawdust and is subsequently dried in airy shade for 2 days. It is germinated in sandy soil under a rain- and sun-proof thatch. Germination occurs in 10-15 days and 5 days later the seedlings are transferred preferably to baskets 15 cm. diameter, 30-35 cm. high, or failing these are planted 20 × 20 cm. apart in nursery beds. The compost must be good garden soil. A lattice shade is provided. The plants are ready for the field in 8 months and must be transplanted with a ball of soil and set under light shade, *Tephrosia candida* or *T. vogelii* planted 1-3 months in advance being suggested as a temporary shade, or *Albizzia falcata* or dadap planted a year in advance as a permanent shade. The plant holes are dug out some months in advance 5 × 5 metres apart. The incorporation of some good stable manure in these holes is advised.

564. SAMAYOA (MENDEZ), O.

633.74

El cacao y su cultivo. (Cacao and its cultivation.)

Rev. agric., Guatemala, 1940, 17 : 325-38.

An account of cacao cultivation in Guatemala. Attention is called to recent modern methods. The propagation of cacao from seed and the various ways of doing this receive considerable attention in the article.

565. KADEN, O. F.

633.74 : 581.192

Untersuchungen des Gerbstoffgehaltes der Kakaobohnen. Versuch einer chemischen Zuchtwahl der Kakaobäume. (Investigations on tannin content in cacao with a view to selection for breeding.)

Tropenpflanzer, 1939, 42 : 409-18.

It is suggested that as selection on botanical lines has not made great progress, an investigation should be undertaken with the chemical composition, especially the amount of tannin, as a basis for selection. Cacao beans of the hard-shelled and short-oval form, the "Calabacillo" type, are on account of their harsh flavour the least valuable economically and contain about 10% of tannin. The yellow, white-fleshed and slender fruit of the "Criollo autentico" on the other hand, contains only about half as much tannin. Between these two extremes are a number of intermediate types with about 7.5% of tannin and fruit of the shape best described as long-oval, the "Amelonado" type. 6% was fixed as the limit between the beans with little and those with much tannin, which also distinguishes the beans producing fine ("Edel") cocoa from those producing ordinary ("Konsum") cocoa. Beans of the former with white or only slightly coloured cotyledons take only 2-3 days to ferment, while the latter with definite violet coloration need 5-8 days' fermentation. The characteristics of the two groups are matched in their hybrids. The tannin content of their beans is altogether less than in the pure "Konsum" cocoa of a similar fruit form. It is a predominant character of the cocoa tree to produce ("Kakaokress") in the beans and at the same time to store up tannin so that the beans become increasingly bitter. The tannin content is also dependent on climate and soil. The best type of "Edel" cocoa with least tannin is found in Central America where climate and soil are most suitable for its cultivation. These trees are not a special species or variety but represent local modifications of the species *Theobroma cacao* L. and under less suitable conditions, revert to the "Konsum" cocoa type and become more susceptible to disease. The hybrids on the other hand, are in many cases, in spite of their low tannin content, very resistant to disease. This is especially true of the red-fruited hybrids. The so-called "Cacao porcelaine" of Java is probably a case

in point. The characters of the local Brazilian types of *T. cacao* are briefly described. It is to be noticed that in the various types the sugar content of the fruit juice is inversely proportional to the amount of tannin in the fruit. The results indicate the importance of hybrids and the possibility of improvement along these lines. In conclusion, the two economically valueless species, *T. bicolor* and *T. grandiflorum*, are described. R.M.I.

566. MILLER, N. C. E. 633.74-2.7

Insects associated with cocoa (*Theobroma cacao*) in Malaya.

Bull. ent. Res., 1941, 32 : 1-16, bibl. 12.

Includes coloured plates of *Helopeltis* spp. and *Gampsocoris pulchellus*.

GOLDING, F. D.

633.74-2.752

Capsid pests of cacao in Nigeria.

Bull. ent. Res., 1941, 32 : 83-9, bibl. 23.

Mainly *Sahlbergella* and *Helopeltis* spp.

567. CADA, E., AND OTHERS. 633.815 + 633.825

Cultural studies of arrowroot, edible canna and turmeric in the College of Agriculture (Philippines).

Philipp. Agric., 1941, 29 : 695-705, bibl. 9.

Two methods of planting the seed pieces were used, namely, on the side of a ridge and in a furrow. Emergence from the soil of arrowroot, edible canna and turmeric occurred at about the same time, e.g. at intervals from 7 to 29 days after planting. Formation of rhizomes began in 97 days with arrowroot, 79 days with canna and 65 days with turmeric. The only cases in which ridge or furrow method had any significant difference were that edible canna plants in the furrow were significantly taller than those on the ridge at flowering time and that turmeric plants on the ridge were taller than those in the furrow where rhizomes began to form. Arrowroot flowered in 196 days and matured in 276 days, canna in 123 days and 324 days and turmeric in 155 days and 236 days. It is suggested that, whereas for rhizome production arrowroot and turmeric may be grown either on ridge or in furrow, edible canna should only be grown in furrow.

568. SWAMY, R. L. N. 633.83

Varieties of cardamom in cultivation in Mysore.

Indian J. agric. Sci., 1940, 10 : 1030-2, bibl. 6.

The cardamoms *Elettaria cardamomum* var. *laxiflora*, var. *mysorensis*, and var. *major* are described and illustrated.

569. AIYER, A. K. Y. N. 633.832

Report on an enquiry into the cultivation of cloves in India.

Misc. Bull. imp. Coun. agric. Res. India 20, 1938, pp. 1-75, bibl. 65, 3s. 9d.

An interesting account of the cultivation of cloves, not only in India but in other parts of the world where they are grown commercially. A report is made on the various localities in India where cultivation should be successful either on a large scale or in small blocks. Flourishing plantations are to be found in certain districts, notably Travancore and the Nilgiris. Reasons advanced to account for the non-extension of clove cultivation are the greater importance attached to tea, coffee, rubber and coconuts, lack of demonstration plots and cultural failures in the somewhat specialized treatment required by seeds and seedlings, which have been erroneously attributed to unsuitability of soil and climate. The correct methods are explained. Experiment is still required under Indian conditions on nursery and plantation practice, vegetative propagation and on protection against pests and diseases.

570. TAYAL, J. N., AND DUTT, S. 633.85 : 581.192

Chemical examination of the seeds of *Martynia diandra*. Composition of the fixed oil.

Proc. nat. Acad. Sci. India, 1939, 9 : 78-82, bibl. 6.

Martynia diandra or Tiger's Claw is an American shrub which has become naturalized in India and is now common on roadsides and waste places. The fruit is highly medicinal and rubbed down with water and applied to the affected part is a remedy for scorpion, wasp or hornet sting. Little is known of its chemical composition and the authors have subjected it to a thorough

examination. In this paper the fixed oil is dealt with. It is a pale, semi-drying oil which was resolved into the following constituents: palmitic acid 8.08, stearic acid 11.25, arachidic acid 1.34, oleic acid 35.84, linolic acid 32.37, unsaponifiable matter (allyl alcohol) 2%. The most interesting and important thing is the yield of allyl alcohol.

571. GREENWAY, P. J. 633.88
East African plants of proved or potential value as drug producers.
E. Afr. agric. J., 1941, 6: 127-34.

This list includes drug plants native to or already introduced into East Africa, and those other East African plants which by reason of their botanical relationship might be expected on investigation to prove acceptable substitute sources for drugs normally derived from other species. Apart from those mentioned in the list an immense number of plants are in native medicinal use but their efficacy and active principles still lack critical investigation.

572. SAMPAIO, S. C. 633.883.2
Pinhão do Paraguai. (Physic nut.)
Rev. Agric., S. Paulo, 1940, 15: 365-78, bibl. 7.

An account is given of the cultivation of the physic nut (*Jatropha curcas*) in Brazil. Usually it is grown in the form of closely planted hedges with the plants 20-50 cm. apart, but the crop is much better if the plants are properly spaced 4 x 4 m. The *jatropha* is well suited to poor soils where other crops would be unprofitable. It is notably drought resistant but want of rain at the right moment will reduce the crop sensibly. Propagation is by seed or cuttings. For the latter process it is only necessary to insert a branch or shoot in the ground to obtain speedily a robust shoot. Budding has proved a rapid and easy way of converting established plants into high yielders. Cultivation consists of occasional weeding, or a cover crop may be grown. The fruits are allowed to fall to the ground for harvesting, those still on the trees being knocked off with sticks. The fruits are collected from the ground and passed through a sieve to remove debris. They are then taken to the drying ground and dried in the sun to release the seeds. A second sieving follows to remove the husks. The trees first come into bearing when 3 years old, budded trees at 2 years. Insect pests are few, the caustic latex acting as a deterrent. An analysis of the fruit and seed is given.

573. WILSON, A., AND MIRCHANDANI, T. J. 633.88.51
Report on the prospects of cinchona cultivation in India. (Second edition.)
Misc. Bull. imp. Coun. agric. Res. India 29, 1940, pp. 117, 4s.

The early history of the rise and fall of quinine cultivation in India is recounted and lessons to be drawn therefrom in any re-establishment of the industry are suggested. The variety to be grown should be *Cinchona ledgeriana* and in the investigations reported here land considered suitable for this variety has been selected. Nurseries maintained by the State are desirable. Cinchona in the seedling stage is much subject to root diseases which often pass undetected till too late and are brought about in the first instance largely by misjudgment of the water requirements of the developing plants. This early work is for the skilled gardener. Research in India should be organized and modelled on work in Java. Experiments in grafting are particularly needed. Failure in India in grafting *ledgeriana* on *succirubra* stock is due to lack of knowledge of the technique. Most of the area under cinchona in Java is composed of this combination. In planning extensions it should be recognized that every new area has its problems and that the testing of land is a prerequisite of success. Full advantage should be taken of the genuine interest in cinchona existing at the present day among owners of land. The commercial aspects are examined from all angles. The second part of the bulletin discusses the conditions bearing on the possibilities of successful cultivation in each of the Provinces in which the crop might be likely to succeed.

574. KREYER, G. K. 633.88.51
The shading of cinchona under field conditions. [Russian.]
Soviet Subtropics, 1940, No. 6, pp. 37-9.

Young cinchona trees are stated to suffer much from excessive insolation. In field experiments in Abkhazia during 1937, non-shaded seedling trees planted out in May when measuring 7 to 11

cm. had grown to a height of 25 cm. in November of the same year, while shaded seedlings of the same type grown in the neighbouring plot had reached 70 cm.; the fresh weight of the non-shaded plants was 37 g. and that of the shaded 198 g. In discussing the relative suitability of various materials for shading preference is given to natural shading, i.e. planting of intermediate rows of shading trees, as against the use of bamboo screens or roofs. As the most suitable trees for planting between the rows of cinchona seedlings, *Acacia* sp., *Gleditschia*, and a number of other deciduous trees, fruit trees, and among annuals *Crotalaria* and others are recommended. The width between the rows of shading trees should be determined by the width of their crowns and the area they are capable of shading at the highest stand of the sun. As this is small when they are young, narrower rows should be planted at first and alternate rows be cut down later. In the case of *Acacia* a distance of 25 metres between the rows of mature trees was found to be best, about 3 metres on each side along the trees being left as a path and the remaining space planted with cinchona seedlings. All rows, both of shading trees and seedlings, should run from east-north-east to west-south-west so as to allow the beneficial rays of the setting and rising sun to reach the seedlings for the longest period possible.

575. RUBBER RESEARCH SCHEME (CEYLON).

633.912-1.531

Notes on rubber seedling nurseries.

Trop. Agriculturist, 1940, 95 : 288-94, bibl. 1, being *Advis. Circ. Ceylon Rubb. Res. Scheme No. 3*.

The site for rubber seedling nurseries should be sheltered but not overshadowed and preferably on flat and well-drained land. Planting distances are rows spaced 1 ft. and 2 ft. apart with 6 in. between the seeds. Methods of preparing the beds on flat and on sloping sites are discussed. Freshly collected seeds of normal size are germinated in prepared beds of river sand. They are placed flat side downwards and if kept properly watered should germinate in 8 days. Seed not germinated on the 14th day should be discarded. After germination the seeds are planted in a horizontal position flat side downwards and lightly covered with earth on which is superimposed bracken or other green material. Watering, if necessary, should be done in the late afternoon. Suggestions are made for manurial treatments which should be used before budding only if the seedlings are backward—the aim being to reach budding size within 2 months—and after budding only if necessary. Preventive treatment against various pests and diseases is outlined. Before budding the plants in the beds should have been reduced by removal of 50% of the weakest. An alternative nursery layout is also suggested which, while resulting in fewer plants, gives an evenly spaced stand. By this method 3 of the germinated seeds are placed in one prepared hole and the two weaker seedlings subsequently eliminated.

576. VAN DER VEEN, R.

633.912 : 581.144.2 : 632.112

Enkele waarnemingen over wortelconcurrentie in een zeer drogen Oostmoesson.

(Observations on root competition during a very dry east monsoon.)

Bergcultures, 1940, 14 : 1519-20.

Ordinary *Leucaena glauca* as a shade tree does not enter into root competition with the under crop. However a very dry east monsoon season brought complaints that the *Leucaena* was causing some damage in certain districts. Subsequent experiment showed that there was direct root competition for water and that it came from 12-15 ft. trees which had not been cut back but had been left with the intention of cutting them to ± 5 ft. after the dry season was over. These trees transpired excessively and, as was found by soil moisture tests, reduced water content of the soil unduly and at a time when the *Hevea* was making fresh leaf. They themselves exhibited all the symptoms of drought. Similar trees cut back to 1½ ft. before the dry season, the pruning being used to mulch the undercrop, were fresh and green, their roots did not compete with the young *Hevea* and the foliage of the latter did not suffer, although the position was more exposed than that holding the taller *Leucaena*. In fact the protection from drying winds afforded by the tall shade trees was more than offset by their demands on the water supply. It was further found that on loose sandy soil clean weeded plots retained the moisture content a good deal better than unweeded plots (8.57% as against 4.26% at 10 inches depth).

577. VOLLEMA, J. S. 633.912
 Herontginningsproblemen in de rubbercultuur. (**Regeneration problems in rubber plantings.**)
Bergcultures, 1941, 15 : 91-100, bibl. 39.

The need for a definite scheme several years before a selected rubber plantation is to be regenerated is pointed out. Points to be considered are the degree of and time to begin heavy tapping of the trees scheduled for removal, effective methods for dealing with existing root disease and the provision of new planting material. A suggested heavy tapping system for the average plantation is two cuts on a half circumference, the second cut as far away as possible from the existing tapping panel. The branches of the second tap two-thirds of the normal length. The tree is tapped every 3rd day for 2 or 3 years; as the time approaches for removal of the tree tapping is done on alternate days and during the last few months daily. Red root disease (*Ganoderma pseudoferreum*) and white root disease (*Fomes lignosus*) can only be tackled by removing all affected trees immediately they are detected and this includes every traceable root. It is a counsel of perfection but much can be done in limiting possible outbreaks. The young plantations on infected soil must be closely watched. The average stand for replanting is 400 budded or 500 seedling plants per hectare. Various methods of arrangement are discussed including "hedge" and contour planting. Choice is largely dictated by site. Where it can be arranged budding in the field on seedlings sown at stake is to be preferred to the planting of budded stumps, although it postpones the time of first tapping for a year, but on shallow soils these plants develop a better root system. On certain poor soils manuring the young regenerated plantation is distinctly beneficial but on good soil it is uneconomic. The wood from the old plantation makes good manure if spread and definitely free from disease. Clean-weeded trees, especially when young, always grow better than trees under a cover crop, but clean-weeding has disadvantages particularly in the matter of erosion which outweigh this. A successful compromise is to clean-weed the space round each tree. Many other points are discussed.

578. DIJKMAN, M. J., AND VOLLEMA, J. S. 633.912-1.541.11
 Resultaten van een hoog gelegen heveacloontoetstuin. (**Hevea clone testing at a high elevation.**) [English summary pp. 2.]
Arch. Rubbercult. Ned. Indië, 1940, 24 : 557-70, bibl. 2.

The highest elevation at which tests of *Hevea* clones were carried out in Java was 515 metres above sea level. The trees at the time were 11 years old. Results so far obtained indicate that at a higher elevation *Hevea* growth is less rapid. The yield during the first tapping years on the basis of tappareability is considerably greater in the case of the *Hevea* growing at high elevations than at lower levels. At the same age the yield at the lower elevations (despite the greater growth) is but slightly in excess of that at higher elevations. There is less susceptibility to wind damage at the higher elevations but a greater susceptibility under the same tapping system to BBB disease. The mutual relations between growth and yield and the relative susceptibility to wind damage and bark diseases on the part of the various clones are not on the whole materially affected by the higher elevation.

579. WHELAN, L. A. 633.912-1.8
 Some aspects of the manuring of young rubber.
Quart. Circ. Ceylon, Rubb. Res. Scheme, 1940, 17 : 228-38.

From information acquired as a result of some experiments in local field trials, experiences of planters and results obtained in other countries, a general manuring policy has been worked out for Ceylon embodying the biennial application of an inorganic nitrogenous manure and every fourth year the application of a moderate dose of phosphate and a smaller amount of potash. Time of application is chiefly governed by the danger of loss of soluble manures during heavy rain. Method of application can best be settled by a study of the conditions on the estate concerned. Although as a result of manuring an increase in vegetation may be prompt in appearing, an increase in yield may not become apparent for some years.

580. MURRAY, R. K. S., AND DE SILVA, C. A. 633.912-1.556.8
Field experiments on Dartonfield Estate. XII. Comparison of tapping systems.

Quart. Circ. Ceylon, Rubb. Res. Scheme, 1940, 17 : 191-200.

Data are given for the 3rd tapping year of an experiment comparing 11 systems of tapping on mature seedling rubber. The report for the first two years (*Ibidem*, 16 : 47-63 ; *H.A.*, 10 : 285) contained the details of experimental design, tapping and recording. Here the results are given in a series of tables and a graph. The yields are shown as a percentage of No. 1 which is $\frac{1}{2}$ spiral on alternate days with change of panel every six months. The comparisons must be accepted with some reserve, since for some unexplained reason the yield of No. 1 showed a marked decline compared with previous years. All systems show a satisfactory rubber content. The largest difference in bark renewal between systems is not significant. The less intensive systems of tapping have resulted in a smaller proportion of trees affected with brown bast.

581. RUBBER RESEARCH SCHEME (CEYLON). 633.912-1.556.8
The international notation for tapping systems.

Quart. Circ. Ceylon Rubb. Res. Scheme, 1940, 17 : 239-46.

Amendments and additions to the recently established International Tapping Notation are published [see also *H.A.*, 11 : 216]. These revisions simplify the notation by reducing its basis to a single convention. This basis is to state the amount of tapping as a fraction of daily tapping on a full-circumference. An average of a quarter-cut tapped per day is taken as standard (100%) in the estimation of relative intensity.

582. HEUBEL, G. A. 633.912-1.556.8
 Resultaten verkregen met vijf verschillende tapsystemen. (**Results of experiments with 5 different tapping systems.**) [English summary 1 p.]
Arch. Rubbercult. Ned. Indië, 1940, 24 : 571-97, bibl. 18.

This experiment has been running on an estate in the Dutch East Indies for 15 years. During the whole period the yield of the more intensive tapping systems (I, s/2, d/2, 100% and IV, s/2, d/1, 20d/40, 100%) is still about 15% higher than that of the lighter ones. Periodic tapping on a half cut for 20 days or on a third cut for 30 days during 15 years in comparison with the alternate daily tapping system gave respectively $\pm 7\%$ and 4% increase besides proving the most economic while the ratio of differences between the tapping systems remained unchanged. Bark consumption was highest in third day tapping system and least in the periodic systems. In none did bark renewal give any trouble.

583. GEHLSSEN, C. A. 633.912-2.8
 Die Rindenbräune von *Hevea brasiliensis*. (**Brown bast of rubber.**)
Tropenpflanzer, 1939, 42 : 323-29.

A short survey of some of the literature dealing with the problem of brown bast of rubber, with special emphasis on the work of J. Schweizer. R.M.I.

584. DUBHASHI, R. S. 634.1/7-1.532/541
Methods of propagating fruit trees.
Indian Fmg, 1941, 2 : 29-31.

Well-known methods including budding and grafting of Indian fruits are described.* There is an interesting photograph of a gootee layered branch showing the method of continuous irrigation of the earth and cowdung rooting mixture in its wrapping of moss by water dripping from a string led from a crock of water suspended overhead.

585. ALLMAN, S. L. 632.77 : 634.1/2
**Foliage poisons for the Queensland fruit fly (*Strumeta tryoni* Froggatt).
 The repellent effect of molasses.**

J. Aust. Inst. agric. Sci., 1940, 6 : 154-60, bibl. 10.

Queensland fruit flies do not find molasses an attractive food compared with sugar and its use definitely lowers the efficiency of foliage poison spray insecticides such as lead arsenate, sodium

* See also Vegetative propagation of tropical and sub-tropical fruits. *Tech. Commun. Bur. Hort. East Malling, 7, 1936, 2s.*

fluorsilicate and tartar emetic. Experiments with other naturally occurring sugars, especially those of a viscous nature found in fruit juices, would appear to offer the most likely means of improving the present white sugar foliage poison baits.

586. RUEHLE, G. D.

634.421-2.4

Algal leaf and fruit spot of guava.

Phytopathology, 1941, 31 : 95-6.

In southern Florida the alga, *Cephaleurus virescens* Kunze, frequently severely attacks the leaves and fruits of the guava, in particular a recently introduced large-fruited Peruvian variety. Control was obtained by spraying with a copper fungicide every 3 or 4 weeks throughout the rainy season. Sulphur sprays applied on the same dates gave little reduction of infection.

587. POPENOE, W.

634.441

The mango : a study in systematic pomology.

Trop. Agriculture, Trin., 1941, 18 : 23-5.

Pomological knowledge of the mango especially in regard to nomenclature and classification is confused and scanty. The author urges that such an important fruit does not merit this neglect and that now is the time to take the matter in hand. He quotes the rules for the technical description of fruit laid down by the American Pomological Society's Proceedings in 1913 and shows how they can be applied to the mango. The characters to be described are those of the stem, base, cavity, apex, surface, skin, flesh, flavour, quality ; the form, size, weight and measurements of all 3 dimensions of the seed must be given and it should be stated whether it is poly- or monoembryonic. Characteristics of growth and productiveness should be fully described ; this includes any peculiarities and, most important, precocity and regularity of bearing and average size of crop. Photographs or accurate illustrations should be provided

588. BERWICK, E. J. H.

634.441

Mangoes in Krian.

Malay. agric. J., 1940, 28 : 517-24, bibl. 2.

The possibility of extending and improving the cultivation of mangoes in Krian, Malaya, is discussed. This district is one of the few in Malaya where mangoes fruit fairly satisfactorily, probably because there is some factor acting as a check to growth comparable to the change from wet to dry seasons in countries where mangoes fruit abundantly. In the case of Krian, which is a padi district with controlled irrigation, the periodic inundation and draining may provide the necessary stimulus. The cultivated mangoes of Krian belong to 3 species, *Mangifera indica* L., the Indian mango, *M. pentandra* Hook. f. to which the common variety Ayer may belong, and *M. odorata* Griff., which produces good quality fruit that fetches a high price. Four other species are common but of little economic value owing to unpalatability. A number of horticultural varieties of *M. indica* and an example each of the two other edible species are described and illustrated. Vegetative propagation by the familiar methods of inarching and budding are described. The best results in raising rootstocks are obtained if the seed is raised in nursery beds, is fresh and has been prepared by the removal of both flesh and husk. Budding should be done in wet weather and when the stocks are 6 months old. The best budwood is obtained from the 3rd and 4th flushes from the end of the branch. This wood will be fairly mature, smooth and green and should have had the leaves from the end of the branch previously removed, so that at the time of budding the buds are just beginning to swell. The budded plant should not be lifted from the bed until the shoot is 2 ft. in length ; if lifted earlier the stem may dry out and the plant die. Good plants should be ready for transplanting within a year from sowing the seed of the stock. There is a note of the possibility of propagation by apogamic seedlings since all the important mangoes in Krian are polyembryonic. A brief note on pests concludes the article.

589. HORN, C. L.

634.471 : 577.15.04

Stimulation of growth in juvenile mangosteen plants.

J. agric. Res., 1940, 61 : 397-400.

In all except a few localities the mangosteen (*Garcinia mangostana*) is notoriously difficult to grow. This has been attributed to its poor root system. At the Puerto Rico Experiment

Station young plants grown in dead sphagnum moss and irrigated with nutrient solution containing yeast extract developed 75·8% more leaf area within 10 months than similarly treated plants having no yeast extract and in both treatments grew much better than plants in good garden soil. Growth stimulation in plants receiving yeast extract was greater in the first ten months than in the succeeding five, which is natural if the effective principle in the yeast extract is vitamin B₁, for normally a plant with leaf area equal to these 10-months-old plants should be capable of producing sufficient vitamin B₁ for its own growth.

590. ANON.

634.57

The kweme or oyster nut (*Telfairea pedata*).

Planters' Chron., 1941, 36 : 78-9, bibl. 2.

The East African kweme or oyster nut (*Telfairea pedata* Hook.) is suggested as a possible economic crop for South India where it is already giving promising results on a coffee and cardamom estate at 3,000 ft. The plant is described. It is a dioecious vine of the *Cucurbitaceae*, of rapid growth, the fruit resembling a large gourd and containing 80-170 nuts the size of a small jam-jar top, in shape something like an oyster and producing a high-class vegetable oil. The seeds are extracted when the ripe gourd bursts open. The oil content, 65% of the whole nut, is used in margarine, cosmetics and confectionery and as a high class cooking oil. The entire nut is palatable if roasted. In 1939 East African shipments of whole nuts fetched £100 per ton. A simple and cheap decortication is now sometimes carried out before shipment. East African yields are 10-15 cwt. per acre. For South India no figures are available. The seeds are sown 6-12 feet apart and on flowering surplus males are cut out, leaving 1 male to 12-15 females. In India the plants are grown on dadap poles set fairly close together; these poles usually root and the vines stretching between them support themselves. Growth is very rapid; a length of 38 feet with a stem of 2 inches in 18 months from seed is mentioned. Some pruning is practised to restrain the plants. There is a wide range of suitable elevations provided the soil is well drained and the rainfall above 35 inches. Some fruit is produced the first year, good crops are secured the second year and thereafter for 20 years or more.

591. VALDÉS, R. R.

634.573

El marañón. (The cashew-nut.)

Rev. agric., Guatemala, 1940, 17 : 282-5.

In a few notes on the cashew nut (taken from the *Revista de Agricultura, Cuba*, undated) it is mentioned that the plant is easily propagated by budding. No distinct varieties exist except the two distinguished by the red or yellow colour of the swollen peduncle, but there are improved selections which can be propagated by budding and may later attain varietal rank. The fleshy part of the fruit is often palatable and used for making wine and vinegar. Medicinally the fruit is considered a specific against dysentery and pulmonary affections. Oil of anacardium mixed with sulphate of iron is used in tanning and provides a chestnut brown graining. The true fruits ("nuts") are the most valuable part, being much used in confectionery in Europe. The chemical composition of the fleshy part of the fruit is given.

592. ANON.

634.6 + 634.61

Coconut and oil palm investigations.

Malay. agric. J., 1940, 28 : 467-71.

Coconuts. At the Coconut Experiment Station, Port Swettenham, in a picking versus nutfall experiment, the mean yield of nuts per palm was unaffected but natural nutfall was followed by a large loss of copra due to germination. Selection experiments are in progress. Selection is based on a comparison of yield of nuts and weight of fresh endosperm together with a consideration of environmental factors. Preliminary selections are then tested for habit of palm, thickness of endosperm and quality of copra. New copra cabinets equipped with a jack-roof have proved highly efficient both in saving of fuel, in increased nut capacity per unit area of grill and in speed of high grade copra manufacture. Experiments have shown that in computing the load of a kiln the thickness as well as the gross weight of wet meat may have to be considered. The chief cause of rubbery copra is ill health in the palms, attributed to lack of effective soil water movement. Manurial treatments in such cases have proved ineffective. Work on the storage of copra has led to the conclusion that to avoid loss and deterioration during storage and transport

copra must be properly prepared and promptly warehoused in bulk. Deterioration, which proceeds rapidly at room temperature, can be effectively checked by loss of excess moisture due to high temperatures obtained on storing copra in large stacks. Deterioration losses especially in the case of raw, half-dried copra may amount to 15-20% of the value of the copra. Serious deterioration leads to an increased number of small pieces which are not favoured by the millers. Small scale extraction of coconut oil has been found impracticable. The bad effect ofalang grass was found not to be due to parasitism on the coconut roots. *Oil palms*. It was definitely ascertained that palm oil shipped abroad is subject to a greater increase in activity than occurs with oil remaining in Malaya. West African varieties of oil palm, selected for depth of colour of oil combined with yield, are to be planted at the Serdang Experiment Station to produce a type of oil more potent than the normal oil for medicinal purposes. The use of palm oil for such purposes is steadily increasing both locally and in India. Bleachability is a new standard of quality now being recognized in commerce and apparently varies greatly. Laboratory work is in progress to acquire information against the time when it becomes of market importance. Laboratory determinations of the oil content of immature fruit from a few bunches indicated that the percentage of oil, calculated on the basis of a dry pericarp, reaches a maximum a few days before the bunch ripens. The variability of the bunches was too great for results to be accepted as conclusive. The self-heating of heaps of freshly separated moist oil palm nuts, which is utilized in small factories to dry them in readiness for cracking, has been traced to thermophilic bacteria, which require a plentiful supply of air. A check to the air supply may result in serious deterioration from moulds.

593. PHILLIPS, J. S. 634.61-2.653/4
Immature nutfall of coconuts in the Solomon Islands.
Bull. ent. Res., 1940, **31** : 295-316, bibl. 22.

The cause of immature nutfall of coconuts in the Solomon Islands, long a mystery, has been definitely traced to injury by the bug *Amblypelta cocophaga* China. An observed population of less than 2 bugs per tree is sufficient to render an area non-bearing. The bugs can successfully attack nuts up to at least 16 weeks old. For various reasons, which are recounted, the only remedial measure possible appears to be that of biological control.

594. VESEY-FITZGERALD, D. 634.61-2.752
The control of coccidae on coconuts in the Seychelles.
Bull. ent. Res., 1940, **31** : 253-83, bibl. 7.

A complex system of scale species attack coconuts in the Seychelles. The life histories and particular requirements of four major species are discussed. Four species of *Coccinellidae* were introduced from East Africa to effect biological control. The life-history, breeding technique and establishment of each is described. Some measure of success in reduction of the scale population below the density at which they cause economic loss has been attained.

595. VESEY-FITZGERALD, D. 634.61-2.76
***Melittomma insulare*, Fairm (Col. *Lymexylonidae*), a serious pest of coconut in the Seychelles.**
Bull. ent. Res., 1941, **31** : 383-98, bibl. 4.

M. insulare is a serious pest of coconuts in Seychelles and Madagascar. The damage caused by the beetle in the bole of the tree depends on the age and situation of the tree attacked. Other things being equal, trees on good soils are damaged least. Remedial measures suggested comprise :—(a) cultural, by earthing up the base of the trunk ; (b) surgical, by incising attacked wood and tarring over the wound ; (c) application of a fumigant at the source of the larval air supply ; (d) sanitary measure to destroy the major breeding centres.

596. REYNE, A. 634.61
Coconut-pearls.
Ann. Jard. bot. Buitenzorg, 1939, **49** : 43-8, bibl. 13.

The so-called coconut pearl often sold in the East as a pearl formed by calcification of the haustorium or germinating apple of the coconut is shown here to be invariably a pearl commonly found in the large bivalve *Tridacna*. The author is able to show that even in certain apparently

well-authenticated cases deception has been practised on the witnesses. The legend is widespread but the coconut pearl that will bear expert examination has yet to be found.

597. ANON.

634.725

The Cape gooseberry.

Qd agric. J., 1940, 54 : 312.

The Cape gooseberry (*Physalis peruviana* L.) is best propagated from seed, 1 oz. being sufficient to plant an acre. The seed is sown in nursery beds of good loam enriched with dry horse manure and kept moist but not shaded. The seedlings can be transplanted 8 weeks after sowing, having been previously hardened off by a reduction in the watering. Before lifting a thorough soaking is given and again after setting in the field. Planting distance is 4' × 4'. A top dressing of 1 part sulphate of ammonia to 2 parts superphosphates may be given if required and a small dose of sulphate of potash just before the fruit appears is beneficial. Harvesting begins 3 months after transplanting and lasts for 2-2½ months, a fair crop being 3,000 lb. of fruit per acre. There is a good local demand for the fruit in Australia at from 4d. to 7d. a lb. Annual planting is recommended but if cut back the plants will last for 2 seasons. The chief diseases are downy mildew, controlled by bordeaux mixture 4-4-50, and soft brown scale, controlled by a white oil spray, 1 in 56.

598. WARDLAW, C. W.

634.771

The banana in Central America. I. Cultivation.

Nature, 1941, 147 : 313-6.

A brief outline is given of the early years of commercial banana growing in the Republic of Honduras. Some notable changes witnessed in recent years are described. The old method of planting the Gros Michel banana pieces, felling the forest trees around them and leaving the latter quickly to decay while the young bananas push up between the rotting branches and fruit within a year still continues. Now, however, before planting a careful topographical and soil survey is made while drainage schemes may extend to the lowering of levels of swamps, the digging of canals and the dredging of rivers, and extensive embankments are thrown up where necessary to protect production areas from flood water. An interesting and successful innovation is the application of overhead irrigation by means of projectors on the ends of tall vertical 5-inch pipes supplied through 14-inch mains by powerful pumps at the rate of 3,500 gallons a minute. Distribution by the overhead projectors has an effective radius of 70 yards, i.e. each projector sprays about 3 acres. Probably unexpectedly, this method has been found greatly to facilitate agricultural operations on heavy clay soils by effecting an actual improvement in tilth and by rendering it possible to use for banana cultivation soils of a much higher clay content than has been formerly possible. Clay soils besides producing good fruit are resistant to Panama disease. The normally tardy initial growth on such soils can be much accelerated by the application of fertilizers in the first months after planting. Flood water, which can be very destructive, has in recent experiments been successfully utilized to deposit silt on selected low-lying areas. In a very few years swampy areas have by this means been so built up that they can be drained and planted with bananas. This work is now being undertaken on a considerable scale. With such methods and preparations for the future there should be no abatement in years to come of either supplies or quality.

599. POPENOE, W.

634.771

Banana culture around the Caribbean.

Trop. Agriculture, Trin., 1941, 18 : 8-12, 33-8.

The cultivation of the banana on the mainland and on the islands of the Caribbean sea is discussed. To summarize very briefly an article full of banana lore the conditions for success are a climate free from extremes ; a deep fine sandy or clay loam ; adequate drainage, the keynote to success, yet often neglected ; attention to spacing when planting ; in weeding the major objective is to keep grass out of the farm at all times, if not by a proper balance of shade then with implements ; broad-leaved vegetation can be cutlashed ; artificial manures can often be profitably used ; the deficient element is usually nitrogen ; pruning a minimum of 3 times a year in wet and 10 times a year in dry climates to ensure prompt removal of suckers not destined for fruit production ; irrigation if necessary, the ideal application being 4 acre inches.

600. ANON.

634.771

Selection of banana suckers.*Qd agric. J.*, 1940, 54 : 312.

Outstanding stools producing fruit of good quality should be marked for propagation purposes. Selection with the Cavendish banana should aim at producing a more open bunch to lessen the harbourage of skin blemishing insects, to allow the bracts to fall more freely and to expose individual fingers more uniformly to the sunlight, thus ensuring uniform development of the bunch.

601. BOWMAN, F. T., AND EASTWOOD, H. W.

634.771-1.83 +1.84

Banana fertilizer experiments.*Agric. Gaz. N.S.W.*, 1940, 51 : 572-3.

Some results are reported of 4-year potash manurial trials with bananas at Cugden on the far north coast of Australia. All plots received a basal dressing each year of 1½ lb. bone dust per stool. The potash treatment consisted of nil, 2 lb., 4 lb. and 6 lb. of sulphate of potash per year applied in three equal dressings in April, August and September. The results statistically analysed showed that the potash treatments made no significant difference. Two plots which received dressings of nitrate of soda at the rate of 3 lb., 1½ lb. and ¾ lb. per stool in successive years showed that nitrogen had strongly increased yield notwithstanding a heavy incidence of leaf spot on the nitrogen plot at the end of the second year.

602. BOWMAN, F. T., AND EASTWOOD, H. W.

634.771-1.8

Banana manurial practices.*Agric. Gaz. N.S.W.*, 1940, 51 : 629-31.

Some experiments on the manuring of bananas in Jamaica and the Philippine Islands are discussed. In Jamaica with Gros Michel no results were obtained from phosphoric acid, 3 lb. of potash per stool only gave a 2% increase over a 5-year period and nitrate of soda applied at the rate of 2 oz. per month per plant in each stool gave an increase of 30% in banana production, of which bunch weight improved by 7% and number of bunches cut increased by 23%. In the Philippines with Cavendish bananas the best results were obtained by using 14.4 oz. nitrate of soda and 3.5 oz. sulphate of potash per plant per year. The methods of applying manures in the banana plantations of New South Wales are discussed. Trenching causes root damage and root concentration, with the result that the plants suffer in dry weather; broadcasting causes more weed growth. Phosphoric acid in various forms and potash may be applied annually since they do not leach readily and for the same reason should be placed as deep as possible and where the roots are. In the case of nitrogen sulphate of ammonia may leach in 6-10 weeks and nitrate of soda even sooner. Thus 6-weekly applications of sulphate of ammonia at 3 oz. per plant per stool or nitrate of soda monthly at 2 oz. per plant per stool are recommended. If complete fertilizers are used 3 applications a year are advised.

603. ANON.

634.771-1.564

Marketing bananas.*Qd agric. J.*, 1940, 54 : 311-2.

Bananas cut and left exposed to the sun even for a short period are reduced to a soft "boiled" condition which renders them unsaleable. The fruit should be cut early in the morning and kept covered even from the early morning sun. It is convenient to have the packing station close at hand, in the plantation if possible. If the bunch is not taken to the shed immediately it should be laid on a bed of leaves or stood upright on bags against a rail at the end of the wire which will transport it to the shed. On being dehanded (Australian bananas are packed in hands or in singles) the fruit should be allowed to "drain" for a few hours before packing or it will sweat and bruise. Fruit in the early stages of ripening should not be packed. The dehanding cut is made just at the collar joining the fingers to the main stalk. A sharp flexible and very narrow knife is necessary. To separate the hands into singles the cluster is grasped firmly with both hands at the stem end, when, by twisting one hand forwards and the other backwards, the fruit is separated easily without any damage to the stalk end. If the cluster pack is used, i.e. three or four instead of singles, the same method should be adopted, a single banana being added to make the cluster up to an even number. The secret of clusters is to have the fruit in twos.

604. LEACH, R.

634.771-2.48

Banana leaf spot investigations. I. The basis of control.*J. Jamaica agric. Soc.*, 1940, **44** : 454-7, 499-502.

Some investigations on banana leaf spot (*Cercospora musae*) under Jamaican conditions are reported. The fungus originates mainly from infection of the heart leaves of the Gros Michel banana. Spraying gives good but not complete control. Damage is dependent on intensity of spore production, this in turn is regulated, particularly by the incidence of dew. Dew formation can be reduced by the provision of light shade. When rains follow a markedly dry spell of weather a sudden stimulus is given to spore production even in lightly diseased areas and there are marked secondary infections arising from conditions not yet properly understood. During the normal dry weather a heavy covering of spray on all leaves should be maintained in order to prevent such outbreaks. A fortnightly spraying is advocated at the start of a campaign. When the disease is under control the spraying intervals may be lengthened, the amount of spotting on the younger (3rd-5th) leaves providing an indication of when to resume. A properly controlled light spray may ultimately prove the most economic means of control without the use of spray in those areas where dew formation is not excessive.

605. CALDWELL, N. E. H.

634.771-2.73

Brown paper bunch covers for the control of banana rust thrips.*Qd agric. J.*, 1940, **44** : 428-9.

The following recommendations for the control of banana rust thrips in Queensland by papering the bunches are made. In normal plantations use single tubes of unglazed brown paper of a D/C rating* of not less than 30 lb. but preferably 35 lb. In exposed plantations use double tubes of unglazed brown paper of D/C rating of not less than 26 lb., or use glazed paper similarly of a D/C rating of not less than 30 lb. Cover the bunches as soon as practicable after they are thrown. Apply a 2% nicotine dust to the bunch at covering and make 3 further applications at weekly intervals. Mark the covers so that the age of the bunches, the time to cease dusting and the time to inspect the bunches for cutting can easily be determined. The tubes can be satisfactorily joined with waterproof glues or they may be sewn. Brown and other papers treated with plastic bitumen, creosote and linseed oil, etc., have not proved satisfactory for several reasons, one being a tendency to cause fruit scald.

606. BURNS, W.

634.775.4

More about spineless cactus.*Indian Fmg.*, 1940, **1** : 499-500.

The author calls attention to two papers on the cultivation of the spineless cactus as fodder in India which had escaped his notice when preparing his recent article on the subject. (*Ibidem*, pp. 160-1; *H.A.*, 10 : 1213.) The first (Fowler, G., and Gopalakrishnamurti, S. Contributions to the study of the prickly pear problem. *J. Ind. Inst. Sci.*, 1923, 6 : 173-84) states that a spineless variety was established without much difficulty in a district (not specified) in southern India with the aid of a very little farmyard manure and a watering twice a week in dry weather. The article as a whole deals with the microscopical and chemical composition of prickly pear and spineless cactus and with their use as green manure and in other ways. The second paper (Mehta, H. G. Spineless opuntia in western India. *Agric. J. India*, 1923, 18 : 417-20) contains valuable data on yield. A first cutting 2½ years after planting of *Opuntia decumana* gave 37.2 tons per acre. Another plantation cut 1 year and 9 months after planting yielded 19 tons per acre. After this cutting the yield rapidly increased and six months extra growth gave double the yield.

607. DASS, C. M.

635.65

The production of dhal (pulses).*Fiji agric. J.*, 1940, **11** : 92-5.

Brief instructions are given for the growing of various pulses which form an important item of diet, especially in communities which are vegetarian or practically so. The pulses are *Cajanus indicus* (arhar, pigeon pea, Congo bean, red gram); two *Phaseolus mungo* vars. (urd and mungh), *Vigna catjang* (cowpea, giant and dwarf), *Glycine hispida* (soya bean).

* D/C rating is a trade designation based on the weight of a ream of sheets each 20" × 30".

608. BOSE, R. D. 016 : 633/635 : 58
List of publications on the botany of Indian crops, Part II, for the period 1928-32.
Misc. Bull. imp. Coun. agric. Res. India **12**, 1936, pp. 198.
 LEVER, R. J. A. W. 632.7 : 634.3 + 634.774 + 633.71
Insect pests of citrus, pineapple and tobacco [in Fiji].
Agric. J., Fiji, 1940, **11** : 99-101, bibl. 12.
 MAMET, R. 632.752 : 634.774
A new mealy bug attacking pineapple plants in Mauritius.
Bull. ent. Res., 1941, **32** : 57-9.
 A description of *Pseudococcus pseudobrevipes*.
 STEVENSON, G. C. 633.61
An investigation into the origin of the sugarcane variety Uba Marot.
Bull. Sugar Cane Res. Stat. Mauritius **17**, 1940, pp. 3-10, bibl. 6.
 CRAIG, N. 633.61
The spread of new varieties of sugarcane in Mauritius.
Bull. Sugar Cane Res. Stat. Mauritius **17**, 1940, pp. 11-6, bibl. 2.

STORAGE.

609. HARRIS, W. V. 664.8
Native methods of food storage in Tanganyika.
E. Afr. agric. J., 1941, **6** : 135-8.

There are 3 main types of native storage methods in the 370,000 sq. miles of Tanganyika, an area containing a wide variety of climatic conditions. They are:—(1) In the dwelling, in a loft between ceiling and roof. (2) In the dwelling, in specially constructed bins resting on the ground and frequently in a part of the hut set apart for the purpose. (3) In various types of stores built separately from the dwelling. These methods are described and illustrated by 12 most interesting photographs.

610. KARMARKAR, D. V., AND JOSHI, B. M. 664.85
The relation of size of fruit to loss in weight in storage.
Indian J. agric. Sci., 1940, **10** : 1021-9, bibl. 7.

The percentage loss in weight in storage at different temperatures was determined for big and small fruit of apples (Hawthorn Greening), chikoo (*Achras zapota*, globular type), banana (Walha), Marsh Seedless grapefruit, Kagadi lime, Mosambi, Malta and Nagpur oranges. The data showed that loss of weight in small fruit is greater than in big fruit except in grapefruit at 68° F. This could in some cases be correlated with the relatively greater surface per unit volume of fruit exposed, with the thinner skin in small fruit and with the higher percentage of pulp in bananas, limes and Nagpur oranges. The ratio of percentage loss in weight of small fruit to the percentage loss of weight in big fruit remained practically constant but the value of the ratio varied with the temperature of storage. The difference in the values of small/big ratio obtained at different temperatures in the case of Nagpur oranges is discussed.

611. TROUT, S. A., TINDALE, G. B., AND HUELIN, F. E. 664.85.11
Investigations on the storage of Jonathan apples grown in Victoria.
Bull. Coun. sci. indust. Research Aust. **135**, 1940, pp. 96, bibl. 24.

Important factors associated with the successful storage of Jonathan apples are—maturity at time of picking, seasonal and growing conditions, size of fruit and of crop, handling treatment, pre-storage conditions after picking, storage temperature, composition of storage atmosphere and duration of storage. A separate chart of 4 colours is provided showing the degree of maturity as indicated by colour at which the fruit should be picked for successful storage and the various ills likely to develop at the other stages of maturity shown on the card. Soft scald can be controlled by storage at 36-37° F. Its greatest incidence is at 32° F. Breakdown at all temperatures has occurred but particularly at 32° F. and is always of the mealy type. Mould and Jonathan spot are favoured by the higher storage temperatures. Delayed storage after picking controlled Jonathan spot in immature and increased it in mature fruit. Soft scald

incidence increases at 32° F. following short periods of delay at 65° F. and 55° F. but decreases after further delay. Cooling fruit for export at 36° to 45° F. rather than leaving it at packing shed temperature before shipping at 34° F. (the best overseas transport temperature) is advised. Gas storage, 5% carbon dioxide and 16% oxygen, at 32° F. results in better conditioned fruit than air storage at the same temperature. Higher concentrations of CO₂ result in the development of brown heart. Treatments of 2-3 days with 35% CO₂ at atmospheric temperatures controlled subsequent soft scald development at 32° F. but increased wastage from breakdown and Jonathan spot. The largest fruit is most susceptible to breakdown and soft scald, the smallest to Jonathan spot. There was no consistency in the effect of humidity of storage atmosphere on wastage from scald and breakdown. Differences in wastage between districts were apparently a result of seasonal conditions.

612. LOEWEL, E. L.

664.85.11

Ergebnisse auf dem Gebiet der Obstlagerung im gärtnerischen Betrieb.

(Apple storage trials in the Lower Elbe district.)

Forschungsdienst, 1940, 9 : 386-97.

An account is given of the best methods used for storing apples in the Altland, Lower Elbe district of Germany. The walls of the stores are of 5 layers consisting of 1 brick, an air layer, a composition peat layer [Torfoleumschicht], a second air layer and finally a $\frac{1}{2}$ brick partition. This arrangement gives protection against very low temperatures and equally against the high temperatures experienced in autumn providing an average temperature of 7.5° C. (45.5° F.). The necessary humidity is provided for by having the floor made of bricks laid in sand and rarely drops below 75% in winter. Excessive humidity is guarded against by the provision in the walls of windows about 4' 10" apart which can be opened as required. Details are given of the storage under these conditions during the autumn and winter of 1936/7, 1937/8 and 1938/9 of 3 popular varieties of apple, namely, Horneburger Pfannkuchenapfel, Echter Glockenapfel and Belle de Boskoop, packed in 15 kg. crates. Notes are given of the separate percentage loss from rots and breakdown respectively in each case. In the Horneburger apple, a white-fleshed juicy and smooth-skinned type, much the greater part of the loss in each year was due to fungi, whereas in the Glockenapfel with its numerous small fruits presenting a very large area for respiration breakdown was largely responsible. In the rough-fruited Boskoop we find that, although on the average breakdown was a more important cause of loss than disease, weather conditions during growth were the all-important factor. Dipping Boskoops in oil emulsion prior to storage resulted in slightly decreased loss both from breakdown and fungi but in such a repulsive appearance of the fruit as to counterbalance this advantage. As regards the fungi responsible for loss, in 48% of the rotted fruits *Fusarium putrefaciens* was responsible, in 33.5% *Gloeosporium album*, in 4.1% *Penicillium*, and in the rest *Botrytis* and *Nectria*. It may be noted that whether the apples come from trees in their "on" or "off" year is most important for their keeping quality. Those from "on" year trees are generally smaller and less ripe and consequently have a longer storage life. In most cases where the apple was slightly damaged by stalk removal or otherwise and later showed signs of rot, scab (*Venturia inaequalis*) was found to be the primary cause and this fact emphasizes the necessity for a late copper spray. Dipping the apples in fungicide prior to storage was not successful. Sprays are found appreciably to affect storage quality. Thus copper sprays, although occasionally causing a roughness of the stem and consequently a greater transpiration loss, always result in decreased rots and later ripening. On the other hand lime-sulphur lead arsenate spraying results in larger leaves and fruit and consequently in shorter storage life. As regards effect of manuring, losses from breakdown were not appreciably affected. Complete NPK manuring resulted, however, in increased loss from rots probably owing to increased size of fruits due to the N. Apples from the NP plots showed the highest losses from rots. Those from KP plots showed losses greater than those from the unmanured plots. Those from NK plots showed the smallest losses of apples from plots treated with N in any combination. In cases of deficiency of N, P or K it was found that the addition of K did not appreciably increase resistance to rot and that the addition of P only slightly increased the incidence of rots. The addition of N, however, in cases of deficiency did have definite results, which varied according to circumstances. In the case of meagre flowering sorts, in which N has a marked effect on size, increased N resulted in increased

rot. In varieties of stronger flowering and fruit set, in which size differences do not become obvious, N resulted in a limited amount of rot. But in varieties in which the application of N resulted in appreciably better fruit set, as sometimes happens with Belle de Boskoop, the fruits, being actually smaller than those on untreated trees, kept longer. As regards the effect of N on keeping quality the size of fruit is the deciding factor. It is noted that even under these ideal conditions of "normal" storage apples of nearly every variety sustain a loss equal to one-fourth to one-fifth of their weight after storing for 100 days. The rest of the article is devoted to a consideration of cold storage and the generally smaller influence on keeping quality of apples of the factors considered above, e.g. spraying, manuring, etc. The advantages are obvious, but the establishment of cold stores depends on finance. Gas storage is not mentioned.

613. HUELIN, F. E., AND TINDALE, G. B. 664.85.25.035.1
Gas storage of peaches.

J. Dep. Agric. Vict., 1941, **39** : 34-8, bibl. 2.

The results described are obtained from work carried out from 1936 to 1940 on the gas storage of peaches. The storage life of peaches in air at 32° F. shows seasonal variation but is little affected by picking maturity. In gas storage peaches picked in firm condition (15 lb. or more) have their life at 32° F. increased. Peaches picked softer (10 lb.) are unaffected or their life may be decreased. Atmospheres containing 8-10% carbon dioxide and 13-11% of oxygen produce the maximum effect in increasing length of storage life of suitable peaches. The increase in length of storage life only occurs when the peaches are subsequently ripened at 60-65° F. If gas stored peaches are removed to 45° F. for subsequent ripening the effect is lost and the peaches may fail to ripen. Thus gas storage is not recommended for peaches for shipment to climates such as that of England where the temperature for ripening at the time of arrival is low.

614. SEATON, H. L., AND GRISWOLD, R. M. 664.85.037 + 664.84.037
Preservation of fruits and vegetables in refrigerated food lockers.
Ext. Bull. Mich. St. Coll. Agric. **208**, 1940 (card folder).

It is an increasing custom in Michigan for farmers and townspeople to take their fresh meats, poultry, fruits and vegetables to the freezer locker plants to be frozen and stored for use months later. This bulletin gives advice on the preparation of fruits and vegetables for freezing. The selection of the right variety is important since not all varieties are adaptable to freezing. Those unsuitable are vegetables with a high water content—tomatoes, lettuce, celery, cucumbers, cabbage, and vegetables with a high starch content, potatoes and certain varieties of peas and Lima beans. Fruits which freeze very successfully are strawberries, red raspberries, blueberries, blackberries, sour red cherries and rhubarb. There are great differences also in suitability between varieties of any one kind. The produce is frozen solid, usually at -15° to -25° F. for 8 to 12 hours and then is stored in the owner's private locker at 0° F. until required. Half the bulletin is taken up with a useful table which indicates at a glance the best freezing varieties of each kind, harvesting and handling instructions, preparation, blanching time in boiling water at 212° F., packing and container.

615. CHEEMA, G. S., AND KARMARKAR, D. V. 664.85.037 + 664.84.037
The cold storage of fruits and vegetables.

Misc. Bull. imp. Coun. agric. Res. India **23**, 1939, pp. 10, 1s.

The work was carried out at the laboratories of the Cold Storage Research Scheme, Ganeshkind Fruit Experiment Station, Kirkee, near Poona. The laboratory plant is briefly described and some introductory notes are given on the factors involved in cold storage. Malta orange and Nagpur orange (Santra) are the best for cold storage, in that order. Malta oranges keep for 4 months at 40° F. and should be of full size and with colour fully developed. Nagpur oranges keep for 3 months and should be full sized and fully ripe. Uninjured fruit shows no deterioration and pretreatments such as washing with antiseptics or wrapping with paper are of no benefit. Full notes on mango storage will be found in abstract 616 but it can be briefly said that at 48° F. Alphonso will keep in good condition for seven weeks with subsequent satisfactory ripening. Optimum storage temperatures for other produce were :—Peaches kept in good condition for one month at 35° F., bananas 2-3 weeks at 56-68° F. according to variety, *Achras zapota* 4-5 weeks

at 52-56° F., litchi 3 months at 30-45° F., apples over 8 months at 32° F., Eureka lemons 2 months at 40° F., seed potatoes about 10 months at 35° F. without much reduction of germinating power, cabbage, Large Drumhead, 6 months at 32° F., cauliflower, Early Snowball, 2 months at 32-35° F. if wrapped in wax paper or their own leaves, French beans 3 weeks at 32-35° F., peas, Poona variety, 4 weeks at 32-35° F. if stored in thin-mesh gunny bags to reduce water loss, carrots 3 months at 32-35° F., young onions, Country variety, 2 months at 32-35° F. Fully developed onions could be kept without sprouting for over 6 months at 32° F.

616. CHEEMA, G. S., KARMARKAR, D. V., AND JOSHI, B. M. 664.85.441.037

Investigations on the cold storage of mangoes.

Misc. Bull. imp. Coun. agric. Res. India 21, 1939, pp. 63, bibl. 19, 6s.

The results reported are those of 3 seasons' work at the Cold Storage Research Scheme Laboratories, Kirkee, India. Only those stages of maturity of the mango known as B and C, i.e. green and mature and green and fully mature, were suitable for cold storage experiment and the B stage gave the best results. Chilling occurred in B below 45° F., resulting in severe pitting and in rotting without ripening on transference to 68° F. or to room temperature. Except from one locality fruit from different climatic and soil conditions showed no marked differences in keeping quality. The rate of ripening of fruit transferred to 68° F. and over after cold storage slackened as the period of storage advanced. The development of total sugars in fruit after cold storage was normal. Stage of maturity and not size influenced behaviour in cold store. Fruit with stalk attached emerged with a brighter appearance but developed brown spots where the gum oozing from the stalk had touched it. Wrapping, especially in waxed paper, impaired ripening power. No packing material was completely satisfactory. Wood wool and rice straw, for instance, caused early rotting on transference to warmer temperatures. A light wadding to hold the fruit in position and minimize bruising is recommended. The fungus *Gloeosporium mangiferae* was responsible for most kinds of wastage. A positive correlation was found between the acid content of green fruit and the length of storage life. Fruit of Alphonso ripened at 68° or 60° F. contained more total sugars than that ripened at room temperature. The sugars were rapidly consumed when the fruit became overripe. Significant chemical changes were found to occur in the fruit remaining green at 30°-52° F. There was a steady loss of weight of fruit in store with no sudden change in rate at the time of ripening.

617. LEONARD, E. R. 631.547.6 : 635.64 + 634.771 + 634.441 + 634.651

Studies in tropical fruits. X. Preliminary observations on transpiration during ripening.

Ann. Bot., Lond., 1941, 5 : 89-119, bibl. 42.

The work recorded was carried out at the Low Temperature Research Station, Trinidad. Three types of transpiration trend during ripening at 85° F. were found for the four kinds of detached fruit examined. Tomatoes (Marglobe) show an initial fall followed by a steady transpiration rate; papaws (Country) an initial fall followed by first a steady and then a continuously rising rate; mangoes (Julie) and bananas (Gros Michel) an initial fall followed by a steady rate and subsequently a trend similar to that of the respiration climacteric. The relation in time between the internal concentration of carbon dioxide and oxygen and the transpiration rate in the papaw is graphed, the colour of the skin at the various stages being noted. A similar study has been made for individual banana fingers. The transpiration rates of the individual hands of a bunch of bananas are given, together with the changes in the pulp/skin ratio and a composite curve for the transpiration rate of an intact bunch deduced. Further investigation of water losses during ripening will call for exploration of the gradients of vapour pressure, of temperature and of water content from the surface to the interior of the fruit.

618. REINHOLD, J., AND VOGELMANN, A. 664.84.13

Eine neue Methode zur quantitativen Bestimmung der Haltbarkeit von Gemüse in Mieten. (A new method for estimating the keeping quality of vegetables in clamps.)

Gartenbauwiss., 1940, 14 : 326-42, from abstract *Forschungsdienst*, 1940, Vol. 10, abstr. p. 47.

The authors have evolved a method of determining whether particular winter vegetables are likely to stand up to storage in clamps. Tests made with carrots were as follows. Ten grammes

of finely sliced carrot were stored in petri dishes and tested at definite intervals, starting directly rots first appeared, for dry weight and ash content. It was found that the quicker the fall in dry weight and, generally speaking, the relative rise in ash content the less suitable were the carrots for storing. Conclusions drawn from the outward appearance of the carrots did not entirely agree with these results, but comparative results after the opening of a clamp agreed very well with results given by the weighing and ashing tests.

619. GERHARDT, F. 664.84.64
Das Problem der Tomatenlagerung. (Storage of tomatoes.)
Forschungsdienst, 1940, 10 : 293-7, bibl. 4.

The normal German-grown tomato will not store well, unlike the imported Dutch grown varieties. This is shown to be due largely to the use of different varieties and to great attention to the method of storing at the correct stage of ripening by the Dutch.

PACKING AND PROCESSING.

620. WHITTAKER, E. C. 631.564 : 634.25 + 634.22
Packing charts for peaches and plums.
Agric. Gaz. N.S.W., 1940, 51 : 625-8.

As it is not possible owing to differences in size and shape between varieties to recommend one standard packing chart for all peaches and plums, suitable charts are given for representative varieties packed in the grape half case. This box is popular because it can be obtained cheaply after being once used for grapes. The size is 18" × 11½" × 5½" deep, inside measurements. The peaches selected are J. H. Hales, Blackburn, Carman and Goldmine Nectarine; the plums are Angelina Burdett, Grand Duke, Narrabeen, Santa Rosa, Ponds Seedling.

621. PEDERSON, C. S., AND OTHERS. 663.2
Keeping quality of bottled wines : effect of head space.
Industr. Engng Chem. (Industrial Edition), 1941, 33 : 304-7, bibl. 6.

Tests showed that the oxygen in the head space of bottled wines was responsible for most of the deleterious changes in colour, flavour, clarity and additional sedimentation which often occur in American wines. It was found that if at bottling the bottles were completely filled with hot wine and closed at once a vacuum occurred on cooling and little deterioration took place.

622. COLTESCU, I. H., AND GOGALNICEANU, S. M. 663.2
Pamanturi adsorbante, incercari de aplicatie in oenologie. (Adsorbent earth, study of application in wine making.)
Anal. Inst. Cerc. agron. Român, 1940, 11 : 351-61.

The author discusses natural adsorbent earths, such as fuller's earth, china clay, etc., and artificial adsorbent earths, and contends that their filtering action is purely physical and that the fluid passing through them undergoes no chemical change. He records the results of experiments in filtering wine through asbestos, infuser earth (?), Spanish earth, china clay mixed with vegetable coal, coagol mixed with gelatine and tannin and a so-called special filter preparation. All but the last present certain disadvantages, in that they leave behind some impurities of the wine, such as albumen, colloids, etc., or are unsuitable owing to slowness. The special filter preparation, which is a mixture of natural adsorbent earth, vegetable coal and casein, is considered fairly satisfactory for most wines. The author concludes that the ideal filter would be made up of natural earth and other components, but that a special composition must be made for various cases, it being impossible to discover a universal composition that would be suitable for all wines.

623. LUECK, R. H., AND PILCHER, R. W. 663.813
Canning fruit juices : technical aspects.
Industr. Engng Chem. (Industrial Edition), 1941, 33 : 292-300, bibl. 41.

The technical background for various unit processes employed in canning fruit juices is reviewed. Several types of juice extractors are described. Retention of unaltered pectin is essential in those juices containing 5-18% insoluble solids to prevent separation of suspended solids in the can. In the case of tomato juice, pectin-methoxylase present is inactivated by heat before extraction to prevent destruction of pectin. To avoid unpalatable flavors in citrus juices, extractors must be adjusted to prevent incorporation in juice of d-limonene from peel oil and

the glucoside, naringin, from albedo and locular wall tissue. The thermal treatment employed in sterilizing citrus juices must be sufficient to inactivate all pectic enzymes present; otherwise, separation of suspended solids will occur. Because of certain spore-bearing anaerobes, for which tomato juice is a favorable growth medium, the thermal treatment necessary to assure sterilization of this juice is more severe than that required by other fruit juices. The application of Ball's method, widely used in the calculation of sterilizing processes for nonacid foods, to the determination of processes for tomato juice is demonstrated. The changes in flavor which some juices undergo after canning are due, in part, to decomposition of levulose formed by acid inversion of sucrose initially present. Chemical changes in an ether-soluble fraction are also a factor. The retention of ascorbic acid in juice packed commercially in tin plate containers is excellent and superior to that in glass containers. This is ascribed to the reduced state of the juice system when preserved in metal containers. Data are given showing effects of stannous and ferrous ions on stability of ascorbic acid in grapefruit juice. [Authors' summary.]

624. CHARLEY, V. L. S.

663.813

Fruit juices. Progress in 1940.

Food Manuf., 1941, 16 : 19, 14.

The author reviews some of the problems, chiefly those created by irregular supply and by the war, which have confronted the manufacture of fruit juice in Britain. He points to the energy with which the Dominions, with more Government assistance than has been given at home, are tackling the processing of their surplus fruit which cannot in present conditions be imported. Dominion workers have already made original and significant contributions to the literature on fruit juices.

625. COE, F. M.

663.813 : 634.11 + 634.23

Apple and cherry juice.

Fruit Prod. J., 1940, 20 : 78-9, reprinted from *Farm and Home science*, Utah (undated).

A method of processing fruit juice from Utah-grown off-grade apples and sour cherry, mainly Montmorency, is described. The hot press method was used for the cherries, as cold pressed juice though of superior flavour was inferior in colour. Clarification was achieved by means of a cloth bag filter. Apple juice was cold pressed to avoid the cooked flavour. An easily made filtering arrangement is illustrated. Sterilization was by either flash or holding pasteurization. If freezing storage is available the fresh juices can be kept for long periods at 10° F. or below. Some information is given on blending different varieties of each fruit.

626. MARSHALL, R. E.

663.813 : 634.11

Processing of apple juice.

Industr. Engng Chem. (Industrial Edition), 1941, 33 : 285-7, bibl. 11.

Brief descriptions are given of the flash sterilization, quick cooling, clarification and deaeration processes in apple juice manufacture. *Flash sterilization.* The author notes that whereas in earlier work the temperature of the juice was raised to 190°, it has now been found that 160° F. is ample and that the quality of the product is much better. For commercial purposes 170° F. is recommended. *Cooling.* This is done by causing the filled containers to revolve in a horizontal position under a spray of cold water for 1-2 minutes, an optimum rotation rate being about 100 r.p.m. *Clarification.* The best, though expensive, method is the disintegration of part of the pectin by an enzyme and precipitation of the materials which cause cloudiness. *Deaeration.* This is not considered essential.

627. LAL SINGH AND LAL, G.

663.813 : 634.11

Studies on the preservation of fruit juices. II.* Experiments on the preparation and preservation of unfermented apple juice.

Misc. Bull. imp. Coun. agric. Res. India 39, 1940, pp. 23, bibl. 33, ls. 3d.

The experiments were carried out with surplus cull fruit of good quality of Yellow Newtown Pippin and Baldwin, being the two most commonly grown apples in the Punjab. Four methods were tried, viz. (1) by holding pasteurization, (2) by the overflowing method of Pederson and

* Part I. Some observations on the preparation and preservation of citrus fruit squashes. *Misc. Bull.* 32, 1939, ls. 6d., reprinted from *Indian J. agric. Sci.*, 1938, 8 : 77-102, bibl. 20; *H.A.*, 8 : 1319.

Tressler, (3) by deaeration in combination with (1), and (4) by chemical preservation with sodium benzoate. Clarification was by filtragol, pectinol, tannin-gelatine and kaolin, of which the first gave the best results, but juices roughly strained to remove coarse fruit-tissue suspensions and bottled under different methods of processing had a superior flavour to those which had been clarified and processed. The preserving treatment under which in all circumstances the maximum characteristic apple flavour is retained is pasteurization in bottle by the overflowing method. The most inferior quality was produced by preservation in sodium benzoate. A tentative method for the preparation and preservation of apple juice for small-scale manufacture is given.

628. CHARLEY, V. L. S.

663.813

Some investigations on the concentration and drying of fruit products.

Chemistry and Industry, 1940, **59** : 823-7.

The author deals with recent work at the Long Ashton Research Station. *Concentrated apple juice products*. Points considered are as follows :—(1) Flavour changes during concentration and the effect of different methods. (2) Ester separation. A scheme of research has been started by Pollard at Long Ashton to enquire into the nature of the volatile constituents of apple juice and into the best methods of separating and retaining them. (3) Pectin problems. Pectin must be removed. Supplies from America of the enzyme used for its removal are limited. British manufacturers should be easily able to supply it. (4) Reduction of acidity. The best conditions for controlled removal of acidity are being examined. (5) Apple treacle. By passing the juice twice through an evaporator or by a single passage using a high steam pressure (15 lb. per square inch) apple treacle can be prepared. It has an s.g. of 1.485, contains 64% invert sugar, 2% sucrose, shows a free acidity of 1.68% and 0.81% "tannin". The chief uses of apple concentrates are :—(1) by the addition of pectin to blended concentrates the production of a new type of concentrated jelly, (2) as a sweetening agent in confectionery, (3) for sweetening or fermentation processes in cider making and similar industries. *Concentrated plum juice*. Extraction is difficult since the plum cannot conveniently be milled owing to its stone, while the consistency of the fruit and the high pectin content of the flesh make the expression of the juice difficult. Moreover, the very high acidity of plums adds a difficulty if it is proposed to use the concentrated juice for any purpose where high acidities are inconvenient. *Fruit purées and spray dried powders*. Notes are given on methods of making and concentrating plum, apple and blackberry purées, and of the conversion of these into powder form. This powder can be easily converted into purée by the addition of water, or into jelly by adding water and sugar or into a very smooth jam.

629. WILLIAMS, J. L., AND HICKINBOTHAM, A. R.

663.813 : 634.8

Progress report on grape juice investigations at Roseworthy Agricultural College.

J. Dep. Agric. S. Aust., 1940, **44** : 268-74, bibl. 3.

The results are discussed of one year's preliminary investigations into the production of grape juice at Roseworthy Agricultural College, S. Australia, in collaboration with the Australian Council for Scientific and Industrial Research. Variety, stage of maturity, condition of the fruit and possibly soils and climate all influence quality of juice. For clearing and filtration treatment with a suitable pectinase preparation is essential. Clarification data for different varieties at different stages of ripeness are still required. A suitable enzyme preparation is probably not obtainable at the moment in Australia. Flavour was improved by blending and by the adjustment with citric acid of the acid content of grapes of low acidity. Grape juice improves in cold storage and deposits tartar. Attention is called to the exploitation of by-products, in fact on the success of this depends the commercial success of grapejuice manufacture in Australia. The value is stressed of grape marc for the production of cream of tartar, a commodity produced entirely from the grape and now through war conditions in very short supply.

630. SCOTT, W. C.

663.813 : 634.323

Determination of peel oil in grapefruit juice.

J. Ass. off. agric. Chem., 1941, **24** : 165-70, bibl. 6.

A method is presented for the measurement of peel oil in citrus juices by steam distillation and recovery of the volatile constituents. It is supported by data showing the constant relation between recoverable oil and the quantity originally incorporated in the juice. The range of oil

recovered from juices extracted by various commercial processes in 1938-39 is also presented. [Author's summary.]

631. BAIER, W. E., AND WILSON, C. W. 634.3 : 547.458.88

Citrus pectates : properties, manufacture and uses.

Industr. Engng Chem. (Industrial Edition), 1941, 33 : 287-91, bibl. 11.

The authors discuss pectic acid and its production, fibrous viscous pectate and the uses and properties of pectates.

632. KNIGHT, A. 634.1/2-1.563.2

Drying fruit for home use.

J. Dep. Agric. Vict., 1941, 39 : 21-4.

Full instructions are given of a simple way of drying for home consumption apples, pears, peaches, prunes, grapes, currants, cherries and figs. Drying may be by the sun, oven or "the home evaporator".

633. GONZALEZ, H. 664.84.036.5 + 664.85.036.5

Fruit and vegetable canning in Chile.

Food Manuf., 1941, 16 : 84-5.

The growth of the Chilean canning industry is briefly traced. It is just reaching the production stage which permits of export abroad. The industry is granted special facilities by the Government which include the return of all customs duties paid on tin and sugar.

634. HUNTLEY, J. G. 664.84.036.5 + 664.85.036.5

Fruit and vegetable canning. Progress in 1940.

Food Manuf., 1941, 16 : 63-4, bibl. 12.

The article is in part concerned with modifications and economies brought about by the war. For economy in sugar a Ministry of Food order has been made that all fruit except apples and fruit in A10 cans is to be packed in a 30° Brix syrup. The exceptions mentioned may be packed in 15° Brix or in water. The can with the highest ratio of capacity to area of tinplate is one in which the height is 1.5 times the diameter; the ratio of capacity of tinplate increases with the volume of the can. In consideration of this Orders have been issued specifying the minimum filling weight in various sizes of can for each product and restricting the sizes of can which may be used. Substitutes for sugar have been investigated. Saccharin may be used with non-acid food products but not with fruit. Dextrose-sucrose blends are stated in America to improve and maintain flavour of fruit and vegetables. It is suggested from recent work that vitamin C content in canned vegetables is likely to be greater than that in unfresh or household cooked vegetables. The addition of sodium carbonate in cooking does not have the destructive effect on vitamin C once supposed. The anti-scorbutic property of black currant juice, superior to that of orange, is emphasized. The value of post-fabrication internally lacquered cans in improving quality and storage life over any other type has been demonstrated. The value of cold-reduced tinplate in decreasing hydrogen formation in cans containing acid products is mentioned. Vegetables have to be processed under pressure unnecessary for fruit. The strain upon the cans causes much spoilage. The British Food Manufacturers Research Association is investigating these pressures which occur principally at the moment of release of the retort pressure. Cold pressure cooling is provisionally recommended as a preventive. A patent has been granted in U.S.A. for preservation of natural green colour in canned vegetables without the addition of colouring matter as generally practised in England. An instrument, the tenderometer, is under commercial production in America which by measuring the force required to drive a number of metallic rods through a mass of green peas provides an indication of the future quality of the canned product. Its use could probably be extended to other of the canners' raw materials.

635. TAYLOR, D. D. C. 664.85.035.5 + 664.84.035.5

Fruit and vegetable preserving.

Country Life Home Front Series 2, 1940, pp. 31, Country Life Ltd., London, 6d.

Describes briefly and simply the theory and practice of jam making, fruit and vegetable bottling and drying, pickling, the making of fruit syrups and storage of fruit and root crops, all under domestic conditions. Modifications to cope with wartime rationing are also suggested.

636. JOSLYN, M. A. 634.1/7-1.56

Color retention in fruit products.

Industr. Engng Chem. (Industrial Edition), 1941, **33** : 308-14, bibl. 77.

The author discusses a number of factors which influence the loss of colour or discolouration in fruit products. He surveys present knowledge of the chemistry of colour changes in natural plant pigments, of non-oxidative discolouration, of enzyme-catalysed oxidative discolouration and of non-enzymic and autocatalytic oxidation. The oxidation of citrus juices and the rôle of ascorbic acid, sulphur dioxide and other factors in browning of these juices are discussed. Sulphur dioxide was found to be not only an excellent anti-oxidant but also a preservative of vitamin C and colour, contrary to other findings.

637. LAL SINGH AND LAL, G. 664.84.64

An investigation on the methods of preparation and standardization of tomato ketchup.

Misc. Bull. imp. Coun. agric. Res. India **31**, 1940, pp. 11, bibl. 5, 8d.

A detailed study is given of the method of preparation and standardization of tomato ketchup. A satisfactory formula has been evolved which results in a product comparing favourably with the well-known imported brands.

638. CRUOSS, W. V. 634.63-1.56

Olive products.

Industr. Engng Chem. (Industrial Edition), 1941, **33** : 300-3, bibl. 23.

The author discusses the procedure for canning olives, which varies according to whether they are ripe, green-ripe, Spanish-style green, Greek-style or Sicilian-style olives. He follows the changes in their composition during pickling and the causes of spoilage during this operation. He gives notes of the discoveries of different workers with regard to the factors influencing colour and composition of preserved olives and on the extraction of olive oil. He notes that at Bari in Italy the refined oil derived from olive pomace is blended with natural virgin oil and used for food. He gives chemical details of oleuropein, the bitter glucoside of the olive.

639. ANON. 678.7

Modern synthetic rubbers.

Planters' Chron., 1940, **35** : 533-4.

This is a summary of an article by K. Frolich which appeared in News Edition, American Chemical Society (exact reference not given). A brief description is given of the synthetic rubbers manufactured to-day, especially in Germany. The original German aim was to find a synthetic rubber which would compare in cost of production with that of real rubber. This principle has been abandoned and modern methods now aim at exceptional quality in the synthetic product. At present butadiene and chloroprene (2 chloro-butadiene) are used, probably on account of availability and cost, as raw materials for synthetic rubber production in Germany where Buna rubbers are now being produced by the emulsion technique. The ingredients are emulsified with water and subjected to conditions of temperature and pressure suitable for converting them into a suspension of synthetic rubber which resembles latex from a rubber tree. The method is quite rapid and though requiring close control presents no problems that differ greatly from those encountered in modern chemical manufacturing. Recovery of the synthetic rubber from the emulsion is similar to the recovery of the natural rubber from latex. Buna S is finding extensive use in German manufacture of motor tyres which resist wear and have a longer life than those from natural rubber. Other uses are indicated and it is stated in conclusion that since these and other rubber polymers are petroleum derivatives there is, in view of the petroleum industry's past record for large-scale operations at low cost, every reason for a considerable expansion in the field of synthetic rubber production.

640. VAN DALFSEN, J. W. 633.912-1.56

De bereiding en de eigenschappen van het rubberpoeder mealorub. (**The preparation and properties of the rubber powder Mealorub.**) [English summary 1 p.]

Arch. Rubbercult. Ned. Indië, 1940, **24** : 633-46, bibl. 5.

An outline of the method of preparation of the rubber powder Mealorub is given. It consists in the flocculation of vulcanized fresh field latex followed by centrifuging disintegration of the

cake obtained and drying. Various properties of the powder are discussed which show that it consists of a conglomerate of vulcanized latex particles, the attraction forces between these particles being small, especially if the powder is in a humid or swollen condition. The attractive forces, it is suggested, are not a chemical binding but are of a secondary nature (Van der Waals forces). [From author's summary.]

641. HAUSER, E. A., AND DEWEY, B. 633.912-1.56
Creaming of rubber latex.
Industr. Engng Chem. (Industrial Edition), 1941, **33** : 127-30, bibl. 18.
 ALVAREZ, A. S. 663.813 : 634.3
 Conservación del jugo de naranja por los procedimientos de pasteurización y "flash-pasteurización". (**Preservation of orange juice by pasteurization and flash-pasteurization.**)
Rev. industr. agric. Tucumán, 1939, **29** : 247-62, bibl. 6.
 CRUESS, W. V., WEST, N., AND BEAVERS, D. 634.63-1.56
Role of certain salts in colour control in olive pickling.
Fruit Prod. J., 1941, **20** : 175, 185.
 LAMB, J., AND SREERANGACHAR, H. B. 633.72-1.56
Studies on the "fermentation" of Ceylon tea. 1. The nature of the enzyme system. 2. Oxidizing enzymes.
Biochem. J., 1940, **34** : 1472-92, bibl. 33.
 HUNTER, R. F., AND SCOTT, A. D. 665.353.4
Palm oil carotenoids. 1. The isolation of lipid pigments from a "Sherbro" palm oil.
Biochem. J., 1941, **35** : 31-8, bibl. 16.
 BROTHER, G. H., MCKINNEY, L. L., AND SUTTLE, W. C. 635.655 : 631.57
Protein plastics from soybean products. Laminated material.
Industr. Engng Chem. (Industrial Edition), 1940, **32** : 1648-51, bibl. 9.

NOTES ON BOOKS AND REPORTS.

642. MEYER, B. S., AND ANDERSON, D. B. 581.1
Plant physiology. A text-book for colleges and universities.
 Chapman & Hall, London, 1940, pp. 696, numerous bibliographies, 24s.

The authors of this book, while not attempting to write an encyclopaedic account of the subject to rival that of E. C. Miller, have produced a textbook which will be of considerable value to the teachers and students to whom it is addressed. Beginning with a description of some physicochemical phenomena with which the student of the subject should be familiar (interfacial phenomena, properties of colloids, diffusion and osmosis), they then deal with cellular phenomena water relations, photosynthesis, mineral nutrition, translocation, respiration, growth, development and tropisms. The topics are discussed clearly and critically. Whether it is necessary or desirable to include the initial section on physicochemical processes is doubtful. It is unfortunately true that most students approach the subject with an inadequate knowledge of physical chemistry, but it is hardly for the authors of a textbook on plant physiology to correct this. The same applies to the sections dealing with anatomy, which has usually been sufficiently studied before the students enter upon a course of plant physiology. No such objection can be raised to the sections dealing with various aspects of biochemistry—the chlorophylls, carbohydrate metabolism, fat metabolism, nitrogen metabolism, digestion and respiratory enzymes. These subjects are usually only lightly touched upon in plant physiology courses, and the gaps are not filled in elsewhere. The treatments here are clear and good. The book could probably be improved by the separation into one or two chapters of the scattered sections on reproductive physiology—at present mixed with an account of growth and other topics. The book's principal failure, though, lies in the region where the subject borders on agriculture and horticulture. The authors give but slight attention to the subject's practical applications. For instance, the relation between rootstock and scion is not mentioned, nor are the many physiological problems arising in fruit storage. The large amount of work that has been done, particularly

during the last fifteen years, on the physiology of manuring and the effect of nutrition on metabolism passes almost unmentioned. Vernalization is dismissed in half a page, and the work at Lisse and Wageningen on the forcing of bulbs is omitted. Each chapter concludes with questions "for thought and discussion". These are often stimulating to the thoughtful student, and the answer is frequently not to be found in the text. They would probably be of more use to the teacher with a class than to an isolated student. A few references to general reviews of the subject with which the chapter has been concerned follow, and then a bibliography of the works to which reference has been made in the text. One is gratified to find that some 30% of these are later than 1935 in date. One is less pleased to find that nearly 85% of them are in English. It is a common failing to over-emphasize the literature in the language with which one is most familiar, and a failing which should be discouraged in students if the linguistic obstacle to scientific development is to be overcome.

D.W.G.

643. LARGE, E. C.

632.4

The advance of the fungi.

Jonathan Cape, London, 1940, pp. 488, classified bibl. 26 pp., 18s.

The book gives an account of various epidemics of plant diseases and of the development of preventive measures, with particular emphasis on their social and economic importance. Professor Brierley in a masterly review* writes, "In these chapters the whole development of our present day concepts is traced, a fascinating historical panorama of mycological and phytopathological research in which idea grows out of idea and disease follows disease in scientific procession; and like a golden thread is the gradual crystallization out of scientific values, the lusty values of plant disease and the thinner scholastic values of academic mycology." The pictorial, dramatic and exciting style in which the book is written (the author has two good novels to his credit) will enhance the interest of the work to the lay reader who hitherto, maybe, has never thought he could be thrilled by a fungus. If he reads this book it can be guaranteed that he will be.

644. LEACH, J. G.

632.7 : 632.3 + 632.8

Insect transmission of plant diseases.

McGraw-Hill Publishing Company Ltd., London, 1940, pp. 615, 42s.

In the introduction it is pointed out that "There is no aspect of the study of plant pathology more fundamentally important than that dealing with the methods by which diseases are transmitted" and further that "The role of insects in the spread and development of plant diseases has been especially slow in receiving the attention that it deserves". In this book is brought together much information that could be found only scattered in diverse publications some of which are not readily available to many who are interested in the various aspects of health and disease in crop plants. The great part that insects play in the transmission of virus diseases has received much attention in recent years, but that they are also often concerned in the dissemination of other diseases of plants has not been so fully recognized and the information on the relation of insects to bacterial and fungal diseases has not hitherto been assembled for assessment in its proper perspective. Plant pathologists with a botanical bias will therefore probably find of special interest chapters VI (Insects and bacterial diseases) and VII (Insects and fungus diseases). Two chapters are devoted to virus diseases, emphasizing and describing various aspects of their dissemination by insects. From the scope of the book the author has not attempted to deal at all fully with virus diseases, but after presenting a general outline of the relation between insects and these diseases (chapter VIII), he gives only a few examples (chapter IX) "selected to illustrate representative types of transmission". Each chapter has a long list of references (chapters VI and VII have respectively 118 and 137), which should prove useful to those who wish to seek further information on points discussed by the author. Specialists may find certain chapters elementary or superfluous, e.g. chapter XII, The anatomy and physiology of plants in relation to injection and insect vectors, and XIII, The anatomy and physiology of insects in relation to the transmission of plant diseases, but the author, in his

* *Ann. appl. Biol.*, 1941, 28 : 78-80.

attempt to present his subject as a logical whole, finds it necessary to give some account of the fundamental facts without which it would be difficult to realize the importance and complexity of the inter-relation between host plants and their diseases, the causal organisms, and the vectors. There are a few misprints: in figure 179 (p. 398) the letters B and C should be transposed.

H.W.

645. DE VRIES, J.

41.3=3=2:5

French-English science dictionary.

McGraw-Hill, Aldwych House, London, W.C.2, 1940, pp. 546, 24s. 6d.

This is a companion volume to the German-English dictionary published in 1939 (*H.A.*, 11:317). Though the actual entries are slightly fewer—some 43,000 as against 48,000—the information in individual entries is rather fuller, a number of common idioms being included and different parts of irregular verbs being given in many cases. There is a list of abbreviations. Like its companion it is of handy dimensions for the pocket and is clearly and attractively printed. The translation of French is rarely quite so easy as appears at first sight. This dictionary should help considerably.

646. GRAINGER, J.

634/635

Garden science.

University of London Press, 1940 (?), pp. 265, 2s. 6d.

This little book is written to assist that "large body of people who are eager to know more about the plants they cultivate and to understand the principles underlying the practice of gardening" and is also especially adapted for the use of schools. Many books have been written with the same laudable intent but few have managed to compress so much intriguing knowledge into a well-illustrated volume fitting handily into the pocket yet printed in a type bold enough to relieve those of "a certain age" of the need to fumble for their reading glasses; a boon to lecturers who may require, youth being what it is, to keep a long-sighted eye in focus on the back benches. A feature of the book is the simplicity of explanation and the large number of simple experiments described that can easily be carried out with the simplest apparatus in proof of the various statements made. It will in fact be found that much of the instruction is imparted in a practical manner, that is, the student is told to perform some simple operation, for example, the gradual pulling apart of a leaf bud, and what he sees is explained stage by stage as the dissection proceeds. The scope of the book can be gauged from the chapter headings—The seed; the green plant; the plant in relation to soil; vegetative propagation and pruning; the flower; fungus diseases of plants; virus diseases; insect pests. These chapters are divided into many small sections each dealing with a separate subject and there is not a superfluous word. Finally there are two appendices which will be helpful to teachers. I. Experimental method and the planning of experiments. II. The planning of a school garden. In making this book the author has had the assistance of leading horticultural research workers and nurserymen whose names, mentioned in the preface, should be sufficient proof that the instruction given is the best possible.

647. HAYHURST, H., AND BRITTEN, H.

664.8:632.6/7

Insect pests in stored products.

Chapman & Hall, London, 1940, pp. 83, 15s.

This slim volume with its excellently clear illustrations by Britten contains a series of articles published in *Food* since August 1939 with certain useful additions. The information, which has not hitherto been available in printed form in this country, is given in simple language acceptable both to the scientist and to the practical fumigator of stored products. The layout is as follows: The offending insects are considered separately in their natural orders, e.g. *Coleoptera*, *Lepidoptera*, etc., details for identification as also notes on products in which each is found being given. Next general control measures are discussed. This section is followed by an alphabetical list of stored products and their pests ranging through ants' nests, bacon, dried bananas to tobacco, walnuts, wool and yeast cake, showing where they are to be found in the text, and finally there is a general index including the scientific names of the insects concerned. The intending reader should not be deterred by the somewhat stiff price.

648. KOBEL, F., SCHMIDT, G., AND KESSLER, H. 634.1/7
Der Schweizer Obstbau. (Fruitgrowing in Switzerland.)
 A. Francke A.G., Bern, 1940 (?), pp. 114, 4.50 Swiss Francs.
 SCHMITZ HÜBSCH, H. 634.1/7
Neuzeitlicher Obstbau. (Modern fruitgrowing.)
 Trowitzsch, Frankfort on Oder, 3rd edition, 1939, pp. 82, 3.60 RM.

649. TUCUMAN. 634.3 + 633.85
 Memoria anual del año 1939. (Annual report of the Tucuman (Argentine)
 Experiment Station.)
 Rev. industr. agric. Tucumán, 1940, 30 : 5-94.

General agriculture and horticulture are dealt with on pages 24-44. *Citrus*. There is considerable discussion on the damage done to citrus groves by salts in irrigation water. It is suggested that it is quite possible to grow good citrus while depending entirely on the rainfall, that even periods of drought and hot winds, which are never so severe as those of Palestine, do less harm than the accumulation of salts from irrigation. Land already affected by these salts may be gradually restored by improving the drainage, abandoning irrigation, freely cultivating the soil and growing a green manure, cowpea and velvet bean being specially useful in this respect. The usual commercial oranges, especially the navel types, have proved unsuccessful and short lists and descriptions are given of a number of oranges which will do well in the district and have a commercial value. Ruby Blood is particularly suitable for North Argentine and is one of the few varieties that will succeed well there on trifoliate stock (*Poncirus trifoliata*). Rangpur lime and sour orange are also very good stocks for it. Extensive rootstock trials with many scion varieties are in progress. The principal stocks under investigation are Rangpur lime, Pomelo Triumph, Persian Lime and Cleopatra mandarin. *Tung*. The planting of tung (*Aleurites fordii*) would have an assured future were it not for the salts in the irrigation water to which the plant is particularly sensitive, since there is available plenty of suitable land otherwise of small value. Wet soils are injurious. *Oil plants. Sunflower*. Owing to the rise in price there has been a great increase in the acreage. The Experiment Station is engaged on selection work. *Soybeans*. These have provided many failures but the crop is so valuable that further attempts should be made. Six selections from the Instituto Fitotecnico at Colonia, Uruguay, are now being tried. The remaining crops dealt with in this section are forage or timber (*Araucaria brasiliana*). The rest of the report chronicles a few plant diseases and describes the various other departments of the station.

650. ROELOFSEN, P. A. 633.71(058)
 Verslag van het Deli Proefstation over het jaar 1939. (Report of the Deli
 (Tobacco) Experiment Station for 1939.)
 Meded. Deli Proefstat. Medan, Sumatra Ser. 3, No. 7, 1940, pp. 83.
 ROYAL METEOROLOGICAL SOCIETY. 581.134
 The phenological report 1940.
 Quart. J. roy. met Soc., 1941, 67 : 67-97, 3s.
 AMERICAN PHYTOPATHOLOGICAL SOCIETY. 632.3/4
 Abstracts of papers presented at the 32nd annual meeting, Philadelphia,
 December 27-31 inclusive.
 Phytopathology, 1941, 31 : 1-26.